The Chemical Age

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Notes and Comments

Over-Taxation in Scotland

WITH a view to investigating the present position and tendencies of the different branches of industry in Scotland, the Scottish National Development Council last year undertook the task of constituting a number of expert technical committees to conduct the necessary surveys. Owing to the nature, extent and ramifications of the chemical industry and having regard to the developments which have taken place in recent years, a survey of the position of that industry in Scotland was deemed to be of urgent importance. The Chemical Industry Committee, under the chairmanship of Professor G. G. Henderson, has lately presented its report—a document which, in our view, represents one of the most useful pieces of research ever conducted in the industry. The report gives a candid statement of all the branches of the chemical industry concerned, and lays particular emphasis upon the evil effects of excessive national and local taxation. Shrinkage of business caused by over-taxation or by fear of over-taxation, expresses itself in a general lack of confidence. This holds up enterprise on the part of existing firms and restrains new firms from setting foot in certain areas.

Glasgow is cited as an example of the handicap of high taxation upon local industry. In regard to rates, the Committee urges that strong representation should be made to have these reduced, in the hope that rating authorities would co-operate in this long view, for the resuscitation of the basic industries would entrain the development of new industries, and the combined result would greatly broaden the basis of rating. The report sums up the possible lines of assistance through action on the part of the Scottish National Development Council under seven headings, and places "lower rates and taxes" second in the list, the first being "lower transport and freight charges."

Possible Lines of Assistance

IN the heyday of its prosperity, the Scottish heavy chemical industry was more evenly distributed over the country as a whole than is the case to-day. In the normal course of evolution, however, old-fashioned works, far removed from their raw materials and consuming centres, gradually dwindled away and died and new works, established on favourable sites and operating more efficient processes, survived and flourished. These changes, says the report, were accelerated by the gradual merging of chemical financial interests in response to the urge for increased efficiency, the result being the concentration of manufacture in a few units. In the light of modern conditions, Great Britain represents a very small area, the need or justification for numerous works distributed over the territory has disappeared, and the size of the minimum economic unit of manufacture is continually increasing, thus accelerating the tendency towards concentration of manufacture in as few works as possible.

Under these conditions, the Committee is of the opinion that no useful purpose would be served by attempting to "put back the clock" in an endeavour to favour one portion of the territory of Great Britain at the expense of another in defiance of sound economic principles. The considerations which govern the establishment and growth of an industry are, or should be, purely economic, and any departure from this standpoint is bound to be attended, sooner or later, with financial disaster. These broader considerations, however, do not preclude the Committee from offering valuable observations upon the opportunities that still await the enterprising chemical manufacturer in Scotland. Under the various sections of the report—extracts from which appear elsewhere in this issue—indications are given of the possibilities of development in certain manufacturing centres. Glasgow, for example, is mentioned as a suitable centre for the extension of the plastics industry. Copies of the report (price 6d.) may be obtained from the secretary of the Scottish National Development Council, 39 Elmbank Crescent, Glasgow.

The Trade Outlook

RECENT speeches by the Chancellor of the Exchequer, the Governor of the Bank of England and others, indicate a far more cheerful trade outlook than could have seemed possible six months or so ago. During the past year no fewer than 650,000 more people have been put into employment in this country. Many investors have still not recovered full confidence and have expressed the fear that the improvement was only due to some local and fleeting cause and that at any time the tide might be expected to turn in the opposite direction so rapidly that they who trusted to the present indications would assuredly be caught. The pessimistic have not been justified. The Chancellor, who should have more facts upon which to base his opinion

than most of us, states: " This is no mere flash in the pan but the beginning of a permanent advance." The wise manufacturer has shown his willingness to seize whatever opportunities may be presented to him by extending his sales efforts, whether by advertising or by any of the other recognised methods. This is not only seen in the chemical industry but in practically every British activity. As the result the improvement in employment is widespread and includes the heavy industries, iron and steel, engineering and shipbuilding, textile trades, woollen and hosiery trades, the electricial industry, some branches of agriculture, motor cars—indeed, in every direction can be seen indications of definite progress and a growing sense of confidence.

The Master Cutler of Sheffield has announced that the output of steel in that city is now at the rate of 27,000 tons per month more than last year and that the average of the output for the whole country has increased by 99,000 tons a month during the past eight months above the comparable figure for last year. Furthermore, several new furnaces have lately been started which should further increase the output. It is further announced that already this year orders for twenty large fishing trawlers have been placed in Hull, whereas not one single such vessel was constructed during the previous two years.

Objects of Co-ordinated Action

THE fact that things are definitely improving is no excuse for any individual to slacken. New markets must be explored, new methods must continue to be devised, the sales campaign that is already showing good results must be intensified. Happy are those who recognised that the lean years were a time for sowing and who, throughout that time, prosecuted research into new products and new processes. The individual efforts of the business houses must be co-ordinated by an equal effort on the part of the Government—indeed of the Governments of the world—and by the banks and financial houses, all working together to consolidate and to extend the success thus achieved. Mr. Neville Chamberlain has indicated four major objects which this co-ordinated action must seek. Firstly, there must be a rise in wholesale prices. Secondly, the trade barriers between nation and nation must be removed or reduced. The Chancellor, rightly or wrongly, believes that these barriers have grown, not as the prime result of a spirit of economic nationalism, but by reason of fears born of experience of uncontrolled inflation in certain European countries. Upon this view, if all fears concerning the stability of currency were removed, the reason for excessive tariffs would disappear. Mr. Chamberlain believes that the World Economic Conference was not without value in assisting the future achievement of this object. Thirdly, an international monetary standard is necessary, which must be practical, workable and will command the confidence of the countries using it. The Chancellor still believes that in the course of time all countries will again return to the gold standard, but that this country cannot contemplate that step yet since the essential conditions are not fulfilled. The fourth object is the resumption of international lending. This must to some extent be at the mercy of a vicious circle, since it cannot be expected that people will lend for industrial development in foreign countries until confidence in those countries and in the world in general is fully restored. This fourth object is likely to be the last to be achieved, but in our opinion its fulfilment is of greater importance than any one of the other three individually.

Experiment in Finance and Industry

THE Governor of the Bank of England last week congratulated the financial world on having proceeded by experience and not by experiment. " We have taken a fresh step in whatever business was ours so soon, but not sooner than, the last step was secure." That is the system on which the position of London in the financial world is based. "The difference between the letters of the words ' experiment ' and ' experience ' is small—the difference in the result is incalculable," exclaims the Governor. " Look where we will, we have seen on all sides this last year one experiment succeed another and of none of these experiments can we yet see the end." This distinction between experience and experiment is singularly interesting to the chemist. The chemist lives by experiment; the financier must avoid it at all costs, if the Governor of the Bank is to be believed. In that difference of outlook lies the root of the comparative rareness with which the chemist attains a seat on a board. Is the chemist, brought up in the school of experiment, too venturesome, too foolhardy to direct the policy of a great concern? The penalty of failure of a chemical experiment in the laboratory is but to start again slightly sadder and a little wiser. The penalty of failure of an experiment on the works is generally no more than a little expense, quite justifiable; but on the works one usually plans in advance what must be done if the experiment fails—more caution must be used than in the laboratory. If, however, an experiment in the conduct of a business fails the result may be the failure of the whole business. For this reason experiments can only be engaged in with the greatest caution and in the best businesses they are only commenced after long and thorough investigation and research.

A Restoration Budget

ALMOST by way of a commentary upon these reflections comes the news of the Australian budget, a budget that has been aptly described as the nearest approach to a prosperity budget that has been seen anywhere since the beginning of the depression. This " restoration budget " remits taxation both direct and indirect on a scale which it is hoped will stimulate employment, lighten the burden on industry and reduce the cost of living. A lowering of taxation in any country is a stimulus to trade all over the world, encouraging demand by increasing the purchasing power of the consumer, *i.e.*, of the taxpayer. We trust our own Chancellor will take the obvious course of adding that desideratum to his list of necessary steps to achieve and consolidate trade improvement, thereby making the four points into five! Nor can be doubted that one of the most important aspects of the Australian budget is the increased preference given to British goods—one of the results of Ottawa.

The Chemical Industry in Scotland

A Survey by the Scottish National Development Council

Business men and others interested in the present position and prospects of the chemical industry in Scotland will read with special attention these extracts from the report, just issued, of the Chemical Industry Committee of the Scottish National Development Council.

THE personnel of the Chemical Industry Committee of the Scottish National Development Council included, Professor G. G. Henderson, F.R.S., Glasgow University (chairman); Professor F. J. Wilson, D.Sc., Royal Technical College (vice-chairman); Messrs. G. H. Christie (United Turkey Red Co., Ltd., Glasgow), A. Johnston (North British Rubber Co., Ltd., Edinburgh), G. F. Merson (Edinburgh), J. MacLeod, F.I.C. (Glasgow Corporation Chemical Works), A. E. Caunce, F.I.C. (W. and J. Martin, Ltd., Glasgow), F. Bain and J. C. Nicholson (Imperial Chemical Industries, Ltd.), Col. A. Stein (J. Stein and Co., Ltd., Bonnybridge), Dr. A. J. Robertson, F.I.C. (J. and J. White, Ltd.), and Dr. J. F. Tocher, F.I.C. (Aberdeen). Dr. I. Vance Hopper, Ph.D. (Royal Technical College, Glasgow) hon. secretary.

In all instances the report gives a candid statement of the present position of the industries concerned; and in many of these the historical treatment given to the subject makes clear the notable advances which have been made in Scottish chemical industry in the past. Some of these pioneering efforts have been maintained and retained, but others have suffered from international competition or have migrated to the south. The reasons given for the retention, the disappearance or the migration of industries should prove of interest to the general reader and of value to the business man, quite apart from the chemical industry.

Foreign Competition

In some of its sections, *e.g.*, those dealing with textile and rubber manufactures the report deals at length with the serious competition which has to be met from Japanese goods not only in the home markets but in the Empire overseas, and it urges that action be taken to deal with this matter. One effect of this Asiatic competition is that most countries possessing national industries have set up enormous tariffs to protect themselves against this competition, and in doing so they have automatically excluded British products. It is unfair, the report states, that Japanese goods should be admitted into Empire markets on the same terms as British goods, while Japan imposes prohibitive tariffs against British goods in all territories under its control. Considerable reference is also made to transport costs and to taxation.

Speaking more particularly of the Glasgow neighbourhood, the number of individual firms was probably greatest in the period just prior to 1890. Subsequently the tendency was towards concentration or disappearance or to both together. The trend may be followed by reference to Tennant's, of St. Rollox, pioneers in the manufacture of bleaching powder, and at one time of the most important chemical works in the world. In 1892 this firm merged into the United Alkali Co., Ltd., and gradually the greater part of its manufactures was transferred to England near to the supply of the raw material, common salt, from which a number of its products are made. The non-existence of deposits of common salt in Scotland and their existence in England inevitably entail the concentration of a number of the more important " heavy " chemical industries in the latter country; and the tendency is for subsidiary industries to concentrate in the same neighbourhood.

The Burden of Taxation

Shrinkage of business caused by over-taxation, or by fear of over-taxation, expresses itself in a general lack of confidence. This holds up enterprise on the part of existing firms and restrains new firms from setting foot in certain areas. Local taxation in Glasgow and in some other areas is high and is a handicap. Districts which have advantages such as reasonable rates, plentiful water supply, etc., should advertise these and thus attract new ventures. In regard to rates, strong representation should be made to have these reduced in the hope that rating authorities would co-operate in this long view, for the resuscitation of the basic industries would entrain the development of new industries and the combined result would greatly broaden the basis of rating.

Cheap rail transport and/or sea freight to the great English consuming centres would be most encouraging. Industries, long established in other centres, have migrated to the South of England to avoid the cost of carriage. For the export markets, Scotland is as well placed geographically as England because shipment from Glasgow, Leith, etc., should be as easy as from English ports. It would, therefore, be helpful if equal freights and facilities could be secured for Scottish ports.

The large amount of pig iron imported into Scotland has caused a decline in the coke oven industry because less coke is required. The Government could help materially by reducing the amount of pig iron relivered to Scotland and spreading this delivery over England as well. It is unfair and a serious handicap to the Scottish coking industry that the bulk of Indian pig iron should find its way into Scotland and thereby keep coke ovens idle. Action in this matter is urgently required.

The Fermentation Industry

The abolition of the 10 per cent. import duty on raw rosin would be welcomed by rosin distillers. Excepting chrome tanning extract, which can be purchased in Glasgow, leather manufacturers have to bring from England most of their requirements of dyes, oils and fats. The bichromate industry is one which, favoured by no outstanding local advantages, and having to bring its raw materials from abroad or from England, has maintained a notable achievement in Scotland. This record, achieved by sheer good management and wise direction, is decidedly encouraging. It is also well known that the Scottish fermentation industry is severly handicapped by the extremely heavy duties on whisky and beer. The production of potable spirit, however, is not the only outlet for this industry nowadays. If one looks to the future, to a time say when the number of products made from ethyl alcohol and from other compounds obtained by fermentation may be almost as numerous as the progeny of coal tar—and such products, being used for other than potable uses, will not be taxed—then one can visualise a bright future for the fermentation industries. Indeed, from the point of view of its use as a fuel the prospects for ethyl alcohol are not discouraging, though perhaps somewhat neglected in this country. Where alcohol can be made from potatoes or cheap carbohydrate material its use will also help the farming industry.

Suggestions for Assistance

" Scotland," the report states, " should produce as far as possible in order to take advantage not only of her own home market and of certain of her ports fr export trade, but also of the plentiful supply of suitable labour which is available. Possible lines of assistance through action on the part of the Scottish National Development Council are to secure (1) lower transport and freight charges; (2) lower rates and taxes; (3) increased protection against the competition of countries such as Japan; (4) a lessening in the amount of Indian pig iron imported into Scotland; (5) Governmental consideration of the suggestion that a minimum percentage of industrial alcohol should be incorporated in petrol; (6) the adoption of a national mark or origin for goods manufactured in Scotland; and (7) Scottish support for Scottish manufacturers.

The trend of the heavy chemical industry in Scotland during the last half century has shown a steady decline in the

shale industry, in textiles (particularly in the dyeing section), and in shipbuilding, etc., each of which has had its effect. For the export trade in a highly competitive world market, Scotland is at a disadvantage compared with England, because of the advantages England offers in regard to the availability of essential raw materials. It is therefore difficult to foresee any tangible development.

The principal manufacturers of sulphuric acid in Scotland are Imperial Chemical Industries, Scottish Agricultural Industries, Scottish Oils, J. and J. White, Thos. Ovens and Sons, Richard Smith's Executors, and R. and J. Garroway. The total quantity of sulphuric acid (reckoned as SO_3) consumed in 1927 amounted to 101,000 tons, compared with an estimated consumption during the twelve months ending June, 1933, of 77,800 tons. The consuming trades and the amounts taken were as follows:—

	1932/33. (est.)	1927.
For sulphate of ammonia	27,520	48,000
For superphosphate	24,700	21,000
For hydrochloric manufacture ...	3,800	7,000
For sulphate of alumina	2,300	1,500
For various purposes	19,480	22,900
Total tonnage of SO_3 consumed ...	77,800	101,000

This table shows that there was a decline in the consumption for the consuming trades, apart from slight increases in superphosphate and sulphate of alumina.

The principal makers of hydrochloric acid are Imperial Chemical Industries, J. and J. White, Alex. Hope, Junr., and R. Smith. The total production and consumption of hydrochloric acid, expressed as acid of 28° Tw., amounted to 23,500 tons in 1927, and 11,700 tons in 1932-33, so that production and consumption have been halved during the period under consideration. About two-thirds of the production of hydrochloric acid is for galvanising purposes and until this trade revives the production of hydrochloric acid is bound to remain at a low ebb. The total amount of salt cake produced was 11,400 tons in 1927, and 5,850 tons in 1932-33. Exports were 6,900 tons in 1927 and 2,350 tons in 1932-33. Of the home consumption, about 60 per cent. goes to the glass trade, and 40 per cent. is for Glauber salts.

Practically all the nitric acid used in Scotland is produced at Ardeer for the manufacture of explosives. In comparison, outside sales are very small.

Artificial Fertilisers

The principal firms engaged in the manufacture, mixing and distribution of fertilisers are as follows: Scottish Agricultural Industries, Thos. Ovens and Son, R. and J. Garroway, Aberdeen Lime Co., North-East Agricultural Co-op. Society, Brechin Agricultural Trading Co., John G. Cunningham, W. S. Ferguson (Perth), Gray and Taylor (Dalkeith), A. Dunn and Sons (Kelso), etc. It is estimated that the importance of Scottish Agricultural Industries, Ltd., is equal to that of all the other firms put together. The approximate consumption of fertilisers for the years 1927 and 1932-33 is shown below:—

	1932/33. (est.)	1927.
Total tonnage of N.P.K. compounds*—(Compounded manures made by establish firms and excluding farm mixing)	100,000	120,000
Total tonnage of "straight" fertilisers—(A large portion subsequently mixed on the farm or by small dealers) ...		
Superphosphate	50,000	70,000
Nitrates of soda and lime	2,000	10,000
Nitrochalk	2,000	—
Sulphate of ammonia	20,000	23,000
Basic slag	10,000	30,000
Ground phosphate and P.K. mixtures (containing 1,500 tons of potash salts, averaging 30% K_2O) ...	12,000	10,000
Potash applied direct (averaging 30% K_2O)	20,500	17,000
Concentrated fertilisers (C.C.F.) ...	1,500	—
Lime and burnt lime	40,000	40,000
Total tonnage of artificial fertilisers	258,000	320,000

* Nitrogen, superphosphate, potash, respectively.

This table shows that, after making allowance for the errors attached to an estimate of this description, the total consumption of fertilisers has declined during the period under consideration.

The total tonnage of N.P.K. compounds consumed in the years 1927 and 1932-33 comprised the following components:

	1932/33. (est.)	1927.
Superphosphate (as 30% soluble) ...	45,000	60,000
Sulphate of ammonia	25,000	21,000
Potash salts (as 30% K_2O)	15,000	16,000
Miscellaneous	15,000	23,000
Total tonnage of N.P.K. compounds ...	100,000	120,000

The amounts (tons) of superphosphate (as 30 per cent. soluble) used in compounds and as "straight" are shown in the table hereunder, together with the superphosphate trade equation (tons) for the same years:—

	1932/33. (est.)	1927.
Superphosphate in compounds ...	45,000	60,000
"Straight" superphosphate ...	50,000	70,000
Total consumed	95,000	130,000

Cyanides and Plastics

The manufacture of cyanide was originally a Scottish industry. The Cassel Cyanide Co., Ltd., was acquired by Imperial Chemical Industries, Ltd., in May, 1927. The cyanide factory was then located in Maryhill, Glasgow. Ninety per cent. of Cassel's trade was export, and the remaining 10 per cent. in the Midlands of England; Scottish business was negligible, and there were no potentialities visible. The essential raw materials in the manufacture of cyanide were produced solely in England, involving heavy transport. The economic situation and world competition demanded that sodium cyanide should be manufactured as near as possible to the source of the necessary primary products. There was no alternative but to close down the Scottish works which were more or less out of date, and erect a modern plant in England to obviate the cost of carriage on the essential raw materials.

The plastic industry is at present very sparsely represented in Scotland by the Aberdeen Comb Works Co., Ltd., Anglo-Scottish Chemical Co., Ltd., and the Scottish Moulding Co., Ltd. There are grounds for anticipating that, as the industry progresses, applications will be found in the shipbuilding and allied industries. In this case, Glasgow would be a suitable centre for the actual moulding factories.

Tanning Industry

Since 1913 the tanning industry in Scotland has definitely declined, apart from the period of war production when Continental supplies were not available. In the last five years some of the smaller tanneries have shut down and the larger ones have, generally speaking, not been regularly working full capacity. The position has been particularly poor since 1929, except in isolated cases. The growth of the automobile industry has helped split hide tanners, and in this connection it is interesting to note that when the Ford Motor Co. investigated the question of the possible use of leather in their bulk production of cars, they discovered they would require more hides than the American Continent could produce. The cheapness of rubber, which led to the production of sole leather substitutes, has affected the sole leather tanners very adversely.

The industry is suffering like other industries from over-production or under consumption, and from that general lack of confidence which is making business most difficult because orders are only placed by manufacturers when they definitely have need of the goods. Vegetable tanning takes from three months even up to twelve months; and chrome leather from four weeks to six weeks to produce. A sole leather tanner can put a certain amount of stock on his shelves with confidence, but fashions and colours can change quickly in upper leather, so heavy stocks, except in black, cannot be carried without some risk. The tanner in consequence is particularly badly hit by lack of confidence or forward orders in business.

The Association of British Chemical Manufacturers

Adverse Effect of Commercial Treaties

ANOTHER strenuous year's work, with special reference to legislation, import duties and commercial treaties with foreign countries, was recorded at the seventeenth annual meeting of the Association of British Chemical Manufacturers, held in London, on Thursday. The annual report presented by Dr. E. F. Armstrong, chairman of the Council, stated that there had been a net membership decrease of four, leaving a total of 105 at the end of the Association's year. Reference was made to the knighthoods conferred during the year upon Dr. G. C. Clayton and Dr. M. O. Forster, and to the losses sustained by the industry through the deaths of Mr. C. P. Merriam, Dr. Alfred Rée, Mr. G. W. Malcolm and Dr. J. Thomas.

During the year the main item of legislation from the point of view of the chemical industry has been the Pharmacy and Poisons Act. The Association and its affiliated associations particularly concerned, namely the British Disinfectant Manufacturers' Association and the Association of British Insecticide Manufacturers, were in agreement with the general principles of the Bill, but they felt that the manufacturing interests should be represented on the Poisons Board which was to be set up under the Act to advise the Home Office in its administration. Active representations were made to the Government, as a result of which arrangements were secured which, in the opinion of the three associations concerned, adequately safeguarded the manufacturing interests.

The Council decided, in view of the conflicting interests within the Association, to take no action on the Budget proposal which imposed a duty of 1d. per gal. on heavy hydrocarbon oils.

The Import Duties Act

During the year the Association has dealt with a large number of questions arising from the Import Duties Act, such as additional duties, free list cases and draw-back applications, and has maintained cordial relations with the Import Duties Advisory Committee. In all of these matters it has followed the established principle that representations in the name of the Association are made only when there is complete agreement among the members, but it naturally endeavours to find, where possible, a basis of agreement which will enable the Association to act.

Acting on a suggestion from the Department of Overseas Trade, the Council decided to send the general manager on a visit to Canada this summer with the primary object of dealing with a number of important points arising from the Ottawa Conference, and of investigating the possibilities of increased British trade with that Dominion. The visit proved most successful. A large number of problems were handled and better progress than anticipated was made in most cases.

Problems of Co-operative Selling

The full details of the agreements reached at the Imperial Economic Conference held at Ottawa in July and August, 1932, were published in October, 1932. Abstracts were at once sent to all members drawing their attention to the items of interest to the chemical industry and to the procedure to be followed in order that full use might be made of the machinery set up for the adjustment of duties. The present position is set out in detail in the report.

The proposals for co-operative selling, with special reference to the Canadian market, which the chairman submitted at the last annual general meeting, have been discussed on several occasions by the fine chemical group and those members of it who are specially interested, but no definite step has yet been taken. The recent visit of the general manager has reinforced the chairman's original plea, and has, in addition, indicated the desirability of a co-operative survey of the Canadian market, so that more accurate data may be available as to its potentialities. A consideration of these proposals is now in hand.

The Association endorsed the views of the Federation of British Industries that the negotiation of new commercial treaties with foreign countries should be postponed as long as possible to enable the new protective measures, initiated by the Import Duties Act, to be more fully worked out, but that if, for political reasons, commercial treaties had to be negotiated, a start should be made with complementary countries such as the Argentine rather than with competitive countries who were likely to seek for reductions in our tariff wall. The Association was also of opinion that the importance of the British market should be used to the full extent to obtain preferences from the negotiating countries without making concessions on our own part, and that we should not be content with most favoured nation agreements extending to all and sundry.

Points from the Commercial Treaties

Points of special interest to the chemical industry in the new treaties so far concluded are as follows:—

Germany.—The exchange of notes which gave an increased quota to British coal and coke reduced the British protective duties on, *inter alia,* acetic acid, acetone, tartaric acid and formaldehyde.

Denmark.—The treaty stabilised and limited the duties that could be imposed in regard to a few chemicals in which one or other country was interested. The main feature was the adoption for the first time of a system of commercial agreements between producing and buying organisations, whereby the Danish purchasing organisation undertook to buy certain agreed quantities of a particular product, for example, salt and saltpetre, during the period of the treaty.

Argentina.—There are no chemical items in the agreement so far published and the supplementary agreement regarding duties on specific products due in August must be awaited.

Norway and Sweden.—The United Kingdom has secured continued free entry for a few important chemicals in return for a number of free list and reduced duty concessions, and the stabilisation of duties on other products.

These treaties, apart from the purchasing agreements in the case of Denmark, do not improve the conditions for our chemical trade with the countries in question. The German treaty will in fact result in greater imports into this country. It is doubtful whether the chemical industry has not lost rather than gained by these treaties.

Safety Measures

The Works Technical Committee has had fewer matters to deal with during the year, but numerous inquiries from members have been answered, and published in the quarterly safety summary, which is becoming widely recognised as a valuable feature.

The Association has continued its close co-operation on safety with the Chemical and Allied Employers' Federation and has submitted to its members who are not members of the Federation, the Federation's safety scheme referred to in the last report. It is clear that the question of safety is taken seriously by the chemical industry. In order to keep a record of the results and to have available, when required, statistics to show the effectiveness of the system, the majority of members of the Association have agreed to co-operate with the Federation in submitting monthly returns of accidents.

Some interesting information has been collected and published in the quarterly Safety Summary in regard to the occurrence of fires in light oil and other stills, believed to be due to the spontaneous ignition of finely divided iron sulphide, and this has led to a modification in the procedure recommended in the Model Safety Rules, Part II., for cleaning stills for inflammable liquids. The possibility of preventing the formation of this spontaneously inflammable deposit is now being examined.

The programme of chemical and physiological investigation in connection with the testing of dangerous atmospheres has been started, but the work has so far been of a preliminary nature. The cost will be divided equally between the Government and the industry.

The Association has always worked in close harmony with the British Chemical Plant Manufacturers' Association and has collaborated in an investigation into the suitability of British homogeneous lead linings and chemical stoneware. At a joint meeting of makers and users the whole subject was frankly discussed. It was gratifying to find that British lead linings are now obtainable as good as any and that the recent remarkable progress in chemical stoneware affords assurance that this country will soon be able to meet all requirements. The joint committee engaged on drafting a standard set of conditions for the purchase of chemical plant has come to the stage at which it was desirable to double the size of the committee for a final study of the draft before its circulation to the members of both Associations for comment. The enlarged committee will shortly commence its task.

The Dyestuffs Industry

The Dyestuffs Industry Development Committee was asked last year to review the situation of the dyestuffs industry and the Dyestuffs Act since its report in 1930. It was unable to present a unanimous document. The majority report, which was signed by all the committee except the two representatives of the colour users, recommended that the Dyestuffs (Import Regulation) Act be continued on its present basis for a period of three years; two of the independent members, however, stipulated that the period should be five years. The minority report urged the discontinuance of the Act. The Government decided to continue the Act for a further year, during which period the Import Duties Advisory Committee would make an inquiry into the whole position and advise as to how the general interest could best be served. The committee has now made its investigation, in the course of which it obtained the observations of the organisations concerned and gave their representatives an opportunity of putting forward their views in person. The Association urged that the Dyestuffs Act should become part of the permanent legislation of the country.

Reference is also made in the report to tar research, chemical warfare, transport problems, the work of the joint chemical patents committee, and the joint trade marks committee, exhibitions, standardisation, the Association's directories, co-operation with other organisations and miscellaneous services to members. Referring to the chemical section at the British Industries Fair, which was moved this year to a more prominent position in the Fair, the report states that the standard of the display continues to improve. The section, however, is steadily decreasing in size, and the Council has expressed the opinion that it is most important that it should worthily represent the chemical industry and help to keep before the Government and the public the claims of this key industry.

Prospects of the Dyestuffs Industry

Dr. ARMSTRONG, in moving the adoption of the report, said there was only one item to which he had anything to add. Since the report was written, the Import Duties Advisory Committee had issued its report on the Dyestuffs Act. Its recommendations called for a continuance, without any set period of time, of the present system of prohibition and licences for dyestuffs proper and their intermediates. Dyestuffs would be put on the Free List so that the user who obtained a licence would be able to import duty free. The allocation to the Import Duties Advisory Committee of the task of investigating any allegation of exploitation, whether in respect of dyes or intermediates, should commend itself to everyone. It would still be necessary to keep a close watch on the situation to ensure that the necessary legislation was couched in clear and unambiguous language as certain of the terms used in the Committee's report, such as "lake pigments" might require a more precise definition for legislative purposes. Apart from this, the dyestuffs industry could look forward to a long period of continued progress uninterrupted by the fear of political interference and to the continuation and development of the co-operation which it had always desired and been ready to give and for which Sir Henry Sutcliffe-Smith had recently put forward a powerful plea, in the mutual interests of makers and users.

The three arduous years during which he had been chairman had seen a new phase of activity for all trade associations brought about by the change in the tariff policy of this country. As a trade they had benefited by the change and the Association had more than justified its existence during an eventful period. The Association's attitude to all tariff questions had been essentially scientific. No case had been put forward without obtaining the agreement of all concerned, without a full and accurate statement of the facts or without that broad and generous interpretation of the situation which sometimes constituted statesmanship. As a result, its representations to the Import Duties Advisory Committee had met with great success while the Committee frequently consulted the Association on points of difficulty.

Its representatives went to Ottawa knowing exactly what they wanted as the result of the preliminary labours of a commitee of experts and, in consequence, broadly speaking, they were successful there. Perhaps the best testimony to their achievements was contained in the American technical Press where the serious effect of the Ottawa agreements on their chemical trade with Canada was set forth in unmistakable terms. This year the work had been followed up by a second visit to settle outstanding matters of detail and to consolidate the ground previously gained. Time was required for the full benefits of the Ottawa agreements to become apparent, and it was still too early to attempt to pass any judgment on them.

A Disappointment

It had been a disappointment to him personally to find no definite support for any kind of scheme of co-operative selling in Canada or the other Dominions. Having kept closely in touch with the Canadian position since Ottawa, he was still convinced that something on these lines was the only road to success. In the present state of international affairs it seemed obvious that, whatever they did in competing with one another in the home trade they should at least preserve a common front in export markets, both Empire and foreign. There was room for more co-operation and there was still an imperative need to take a wider view in many cases if they were either to hold their own or make still further progress. The times had forced reorganisation everywhere; large units prevailed. There was less freedom of buying, and there was more control over any particular material. If they were to secure equitable terms they must be prepared to sink individual suspicions and differences and to act together for the ultimate wealth of all.

Relations with Government Departments

Their relations with many Governments had been more than friendly and it was a pleasure to acknowledge the assistance they had had. It is their policy to help, to advise, to instruct and to criticise constructively, where necessary, instead of adversely, and although they had had blows resulting from some of the trade agreements, they had accepted them in a good spirit imagining that they had been prompted by good and sufficient reasons. The problem of new commercial treaties was one to which they must give continuous attention and the present refusal of the Government to consult industry must be steadily worn down. There was no real reason why the Government should not obtain from organised industry, which alone could foresee the commercial effects of any treaty, full particulars as to the probable results of any change in duties and it could do this without in any way abrogating its responsibility to look after the interests of the community as a whole. As an example of how unfairly British industry might be treated, he instanced the case of tartaric acid. The British Government reduced what was in reality an inadequate duty of 20 per cent. to 15 per cent. at the request of Germany. This was immediately followed by a doubled duty on tartaric acid into Germany so as to eliminate the last possibility of British trade in that market. While this change was directed primarily against Spain, nevertheless it hit the British manufacturer by virtue of the most favoured nation clause which was in practically all commercial treaties.

As regards the future, they had still many problems on hand in connection with the Import Duties Act, the Ottawa Agreements and the new commercial treaty negotiations. They would also have to keep a close watch on the new dyestuffs legislation and the other points which arose from the recommendations of the Import Duties Advisory Committee, in addition to work on safety, traffic, etc.

The Place of Oil in the World of Fuel

Melchett Lecture of the Institute of Fuel

The Melchett lecture of the Institute of Fuel was delivered to members of the Institute and other societies by Sir John Cadman, D.Sc., at the Geological Society's rooms, Burlington House, London, on Wednesday, October 11, the chair being taken by Sir Hugo Hirst.

BETWEEN 20 and 25 years ago, in Great Britain, oil was acclaimed as a great agent of progress. In those days, said Sir John, no popular thought was devoted to considering the place that ought to be ascribed to oil in the world of fuel; nor was the coal industry exercised in mind concerning the encroachment of oil upon its prerogatives. It is probable, indeed, that the coal industry welcomed the advent of oil and the new mechanisms it had served to create, because it observed that each of those mechanisms required iron, steel and other metals, as well as power, in its construction, and thus increased the consumption of coal—a fact which time has made more and more evident, though the mists of controversy have tended to obscure it.

The displacement, partial or otherwise, of an established interest by a new product or a new process is not a recent development in the evolution of fuels. Not so very long ago coal was the intruder. In its early days as a factor in modern industry, coal ruined the charcoal and wood fuel industries; it obliterated the iron-smelting trade of the Weald; at stages throughout the development of industry and mechanisation it altered almost every aspect of English industry and put an end finally to the age-old practice of manufacture by hand. In a hundred years' time, perhaps, the loudspeakers of the day will resound with the complaints of the oil industry that its vested interests are being endangered by the competition of energy derived from other sources such as the tides or the sun, or produced by some process of which we are as yet unaware.

The Comparison of Oil and Coal

Oil is a liquid. It is raised to the surface by means of wells from which it flows under the impulsion of natuarl forces, or in which it is raised by pumping or other mechanical means. Crude oil, in general, needs treatment before it is suitable for industrial or other uses. Its net calorific value is of the order of 18,000 B.Th.U. per lb. From crude petroleum we obtain motor spirit, kerosene, gas oil, diesel and fuel oils, lubricants, a range of special products, and gas. Coal, on the other hand, is a solid. It is mined largely by human exertion. It can be burnt in the raw mass or treated to produce other fuels such as gas or coke, and to yield benzol, tar, sulphate of ammonia and other products. The net calorific value of coal, although it varies with different grades, may be taken to be approximately 12,500 B.Th.U. per lb.

Oil, being a liquid, may be transported by means of pipes over distances which are limited solely by geographical or economic factors, the rate of transportation being a mere matter of the diameter of the pipe and the capacity of the pumps. When the sea is reached, oil can be loaded into ships through pipes at almost any rate—at the moment as much as 1,500 tons an hour can be attained. Finally, it is fed automatically to furnaces or to internal combustion engines. Throughout the whole of its progress from the refinery to the ultimate point of combustion—it may be several thousands of miles—the passage of oil is characterised by the very large quantities handled, and by the fact that manual exertion is restricted virtually to the tending of machines and the controlling of valves. The transport of coal, on the other hand, involves manual labour at every phase from the coal face onwards.

Oil and coal however, are not wholly comparable. Oil requires treatment before it can be consumed as motor spirit, kerosene, diesel oil and fuel oil. Coal may be burnt in the raw mass or it may be treated to yield gas and coke. Some of these fuels serve identical purposes; others do not. Motor spirit, for instance, competes little, if at all, in the fuel market with coal. Coke has a sphere of utilisation which is not widely open to any petroleum product. Fuel oil and coal, nevertheless, are both used principally for steam raising; and it is their application to this purpose that, to a great extent, determines the wider relationship of the two fuels.

Choice of Fuel for Steam Raising

The choice of a fuel for steam raising depends upon a wide range of factors. On land, for example, in regions not greatly distant from coal-producing areas, large or small power-units served by labour-saving devices are operated most economically with coal as their fuel. At sea, on the other hand, questions of transport, storage, handling and cleanliness, as well as space occupied by bunkers and engines, are all of importance. In all cases the cost of fuel itself is a major factor. On this score it is not possible to make any universally valid comparison between coal and fuel oil.

Since coal is the sole product of a coal mine, the cost of that fuel in normal times must be adequate to cover all expenses of production, transport and distribution; but owing to competition among collieries and coal-producing countries, the price of coal—again in normal times—cannot rise to any inordinate figure. Fuel oil, on the other hand, is the residual product of the distillation of oil; and its price or value depends upon a combination of influences. Market demand, for instance, has its effect; variations in requirements of other products, by affecting the quantities of crude oil distilled, may cause a shortage or excess of fuel oil. The demand for motor spirit may cause a considerable increase in the process of cracking—which uses fuel oil as its raw material—thus withdrawing quantities of that oil from ordinary market supplies. Each of these factors has an influence on price. In addition, coal and oil must vary in price according to expenses of transport.

The Steamer and the Motor Ship

Various factors have influenced ship-owners to adopt oil as a fuel. Bunkers can be fueled with much greater ease and cleanliness. A fuel oil barge can bring supplies to any point where the vessel itself is lying, whether in dock or at anchor. Virtually any vacant space can be used for bunkers; and proximity to the stokehold—an important consideration with coal—becomes immaterial. Bulk for bulk, moreover, fuel oil contains greater potential energy than coal and, therefore, less space is required for storage in the case of a given supply of power. The number of stokers can be reduced by two-thirds and steam raising can be effected with much greater rapidity. But it is not only the use of oil in steam raising which has brought about so great a "sea change." The steamer is now faced with a dangerous rival in the motor-ship. In 1914, Lloyd's Register showed that the world tonnage of motor vessels propelled by internal combustion engines amounted to 220,000 tons—that is, 0.45 per cent. of the world's aggregate tonnage at that time. The latest available figures indicate that motor-ships now afloat have a tonnage of over 10 millions and they represent 15 per cent. of the world's shipping.

Here is an instance of the manner in which science and economics sometimes march hand in hand. The approximate thermal efficiency of a large steam reciprocating marine engine may be placed at 15 per cent. A steam turbine operating under superheated steam attains 20 per cent. An internal combustion engine of the type installed in modern ships has a thermal efficiency of approximately 35 per cent. The use of oil for compression-ignition engines in ships, therefore, has

resulted not only in economies but it enables also a given amount of work to be performed with the least possible drain upon the world's natural reserves of potential energy.

The annual production of oil throughout the world at the present time is of the order of 180 million tons. Of that quantity, it is estimated that less than 20 million tons are consumed as bunkers at sea. The world's annual production of coal is vastly greater than that of oil and amounted in 1932 to over 1,000 million tons. The maritime consumption of oil, therefore, is small in relation to the world's annual output of coal, and it cannot of itself alone be the cause of all the misfortunes which have befallen the British coal industry.

Between 1913 and 1932 the consumption of coal in this country dropped by 34 million tons to less than 150 millions, but the internal consumption of fuel oil has only risen by 735,000 tons to 1,390,000 tons.

The Metamorphosis of Coal

There are certain fields which coal as a solid can never hope to reconquer, but science increasingly applied to coal may enable it to rise from the ashes of its own more economical combustion, and seek use in fresh fields. Two methods are available for coal to achieve metamorphosis. The first is gasification; the second, perhaps, hydrogenation. The gasification of one pound of coal having a net calorific value of 12,500 B.Th.U. per lb. produces 8,050 B.Th.U. and 2,680 B.Th.U. in the form of coke and gas respectively—a total of 10,730 B.Th.U. In addition, a further 1,150 B.Th.U. are consumed in the carbonisation of coal, and a range of products—fuel and otherwise—is obtained in the form of benzol, tar and sulphate of ammonia. In all, therefore, the calorific value of coke and gas produced to coal consumed stands in the relation of 77 to 100. That is to say, the thermal efficiency of the process is 77 per cent. If the resultant tar is also allotted a fuel value in accordance with its B.Th.U. content, this adds a further 900 B.Th.U., and increases the thermal efficiency to 84 per cent.

The gas industry is quite dissociated from the coal industry, and relations between the two have always been those simply of a buyer and a seller of material. Where there should have been co-operation there has been the desire on the one side to profit and on the other to buy cheaply, regardless of the range of mutual advantages which lie between those extremes. Indeed, what a different picture could have been painted had the collieries sold their calories direct to the consumer, whether in the form of a lump of coal, of coke or gas. The industry would have secured a strong and powerful influence in the land instead of having become a political pawn.

The Restricted Use of Gas

The operations of gas companies are strictly limited to a defined and local area. The companies may only make gas of a determined purity; they must supply all applicants; they are forbidden to make any distinction between consumers of the same class; their profits are limited to the amount required to pay statutory dividends; and the capital employed is regulated by Act of Parliament. In consequence of these impediments, and others, the gas industry as a whole is in no position to exploit the full potentialities of the fuel which it produces. If its conditions of working had been otherwise than they are—if it had been in close association with coal and if it had been free of the worst restrictions—gas would long ago have provided for several of those demands on land which have fallen to oil.

There is no doubt that if solid coal could assume a fluid form its adaptability would thus be greatly enhanced. Technically the process of hydrogenation is already a success. That is to say, coal has already been hydrogenated into oil. No reason is yet apparent which would oppose any technical barrier to large-scale treatment of coal by that process, and the public spirit of Imperial Chemical Industries in making a large-scale experiment is to be applauded.

Scientific standards and technical considerations, however, are not the sole controlling factors. In some cases—perhaps in that of hydrogenation—it would be better if they were. It has been stated that the production of 1 lb. of motor spirit necessitates the hydrogenation of 1.6 lb. of coal. In addition coal or other fuel is consumed in the operation amounting, in relation to 1 lb. of spirit produced, to 1.6 lb. of coal. The process of hydrogenation, moreover, needs hydrogen for its accomplishment, and it may reasonably be assumed that hydrogen representing a thermal value of 8,300 B.Th.U. is needed for every pound of petrol produced. In all, therefore, 48,300 B.Th.U. in coal or other fuel and hydrogen are consumed in the synthetic production of 1 lb. of motor spirit which, when it is attained, has itself a net calorific value of 18,900 B.Th.U. per lb. The ratio of potential energy consumed to that produced is, therefore, approximately 2.5 to 1; or a thermal efficiency for the process of 39 per cent.

If, in order to conform with the requirements of modern industry or commerce, it is essential that coal should be transformed—whether in whole or in part—from a solid mass to a fluid, it is inevitable that a proportion of energy should be lost in the process. In the case of gasification—which, of course, is only a partial transformation from solid to fluid—the loss of energy amounts to approximately 20 per cent. of that contained in the material treated and consumed. In hydrogenation, however, the loss amounts to over 60 per cent. and the object achieved—unlike that obtained by gasification—is the production merely of a substance which at the present time, nature itself is yielding in plethoric quantity. To judge by scientific standards, such a transformation is unnecessary and wasteful.

Colliery Owners and Coal Consumers

In the past, and to a great extent even in the present, the coal industry has concerned itself solely with the production of coal and its sale in the solid mass at the pithead. Thereafter, the industry ceases generally to be interested in its product; and it too often happens that whatever scientific or commercial progress the coal industry makes results not from anticipation of the needs of consumers, but from pressure by them to compel the industry to adapt its products to their requirements. The colliery and the consumer are really out of touch. The case of hydrogenation is to the point. Whatever the merits of that process may be, it is surely a matter of the first interest to the coal industry that it should be tested. Instead, however, of the testing being done by coal owners, it is the chemical industry which has adopted hydrogenation; and, if that process should succeed, it will no doubt be the chemical industry which will mainly benefit.

The oil industry has perhaps been more fortunate than coal. It is still relatively young. In the case of most enterprises a considerable sum of capital has had to be expended in the initial processes of exploration, discovery and exploitation. In consequence, the production of oil has been effected to a great extent by large corporations, possessing ample capital resources; and those corporations early appreciated the wisdom of themselves handling every branch of petroleum activities, from exploration for oil to ultimate sale to the consumer. As a result of this unification of control, the oil industry has been constantly aware of variations in demand for it products, of new possibilities, and of declining tendencies. In the early days of the industry, for instance, the principal product of petroleum wa kerosene. The advent of the internal combustion engine and the suitability of fuel oil for use under boilers effected readjustments in demand. The industry was quick to profit from the greater utilisation of its products rendered possible by those changes.

A Scientific Achievement of Oil Fuel

Contemporaneously with the influence of demand upon supply, the chemists and physicists employed by the oil industry in its research stations have constantly endeavoured to improve their products and to aim at an industrial condition in which virtually every fraction of the crude oil produced from wells is utilised for some profitable end. To-day, with the exception of inevitable losses in distillation and treatment, nothing that can be used is wasted. The immediate object of processes such as these is to earn a profit on the enterprise as a whole. In a full consideration, however, they go deeper.

The world's reserves of fuel—whether that fuel be oil or coal—are limited, even though their full extent remains yet unknown. It is therefore to our interest, and to that of posterity, that each fuel should be made to yield the maximum amount of energy which human ingenuity can extract from it. To the scientist, waste is abhorrent.

Sedimentation of Fine Particles in Liquids

A Survey of Theory and Practice

The sedimentation of fine particles in liquids has now become an important feature in many manufacturing processes. Dr. E. J. Roberts, one of the joint authors of this paper, is physical chemist in the research department of the Dorr Oliver Co., Ltd., at Westport, U.S.A.

THE underlying principles of sedimentation were discussed in a joint paper by Mr. R. F. Stewart and Dr. E. J. Roberts, presented at a meeting of the Institution of Chemical Engineers, held in the Chemical Society's rooms at Burlington House, London, on October 6, when Mr. H. Talbot, vice-president of the Institution, presided.

In 1850 Stokes derived the law applicable to the uniform slow motion of a rigid sphere in a viscous fluid of infinite extent. His equation for the resistance to motion developed by the interaction of the moving sphere and the viscous fluid is: $F = 6 \pi s r v$, where F = resistance or force opposing the motion; s = viscosity of fluid; r = radius of sphere; v = velocity of sphere in cm/sec. For a sphere falling with uniform velocity under the force of gravity, the force F is opposed by the equal and opposite force F_1, $F_1 = 4/3 \pi g r^3 (d_s - d_e)$; where d_s = density of the solid; d_1 = density of the fluid; g = acceleration due to gravity. Equating these expressions and solving for v, the result:—

$$v = 2/9\, g \frac{(d_s - d_1)\, r^2}{s}$$

is obtained which is the familiar law, which states that the velocity varies as the square of the radius of the particle. The limitations imposed on this equation are that the fluid is infinite in extent, the velocity is uniform and low, and the object is a sphere and rigid. Furthermore, the fluid must be homogeneous—that is, the distance between the particles of the fluid must be small compared with the diameter of the sphere. Corrections for the finite extent of the fluid have been the subject of theoretical and experimental treatment by a number of authors.

When the velocity of fall is relatively great, the falling body must force liquid from the line of fall and impress motion on this liquid which motion is finally absorbed in eddies. The resistance to the fall of the particle under such conditions is "eddy" resistance. When the velocity of fall is small, eddy resistance is negligible, the controlling resistance being due to the viscosity of the liquid, that is to skin friction with the particle surface. Under these conditions the resistance is termed "viscous" resistance.

Properties of Flocs

Flocs have certain elastic properties. If, for example, certain milk of magnesia slurries are allowed to settle quietly, they will settle until the concentration of solids is from 4 to 7 per cent., and then remain stable. However, if stirred very slowly to move the flocs around and roll, squeeze and work them, concentrations as high as 25 per cent. $Mg(OH)_2$ may be produced. Such an overthickened slurry is quite rigid, in other words the yield value is very high. However, by proper treatment with water the pulp may be restored to the stable 7 per cent. state. Some flocculent clays act similarly. Thus flocs are compressible and expansible within certain limits merely by removing or adding water.

The density difference is very important in determining the rate of fall of particles in the presence of other particles. The movement of a large particle may be retarded considerably by an increase in the effective density of the medium due to the presence of smaller particles of the same substance. Still more drastic changes may be caused by the presence of large amounts of fine particles of a higher specific gravity. The use of barium sulphate in rotary drill mud, and of sand in coal cleaning, may be cited as commercial examples. A third possibility is to have larger particles of the same density in a column in which a large number of the particles are just kept in motion by a rising current.

The practical application of sedimentation falls into two groups, one of sizing, classification or hydro-separation, and the other of clarification and thickening. The former is best carried out in dispersed pulps and the latter on flocculent pulps. Flocs tend to settle faster than the individual particles, so if fine material is to be dewatered it should be made flocculent. On the other hand some flocs of very fine material may well be larger than individual grains of coarser material and consequently settle at the same rate or even faster. Further, the yield value of the flocs, or of the flocculent pulp, is often high enough to cause entrainment and prevent fine granular material from separating. Therefore, dispersion is generally essential for all fine separations although usually of no consequence when the separation to be made is 100 mesh or coarser.

Continuous commercial classifiers all make use of what is in fact or in effect an upward current of liquid to make the desired separation. Those making use of an upward stream of liquid in fact are called "hydraulic" classifiers and those in which the water has an upward velocity in effect only are termed non-hydraulic, whole current or surface current classifiers.

In hydraulic classifiers, the solid particles settle against a rising current of water in some kind of a sorting chamber. There are two types: one in which the density of the pulp is low, called the "free settling type," and the other in which the pulp density is high, called the "hindered settling type." Of the former, the most familiar example is the laboratory elutriator.

Non-Hydraulic Classifiers

In non-hydraulic classifiers all the water enters with the feed which flows over the surface of a settling chamber to an overflow lip. The only vertical currents are eddy currents caused by the surface flow. However, in effect, there is an upward current equal to the volume of the feed divided by the area of the tank. The non-hydraulic classifiers, moreover, may be divided into two groups, non-mechanical and mechanical.

The non-mechanical type consists of tanks in which the feed flows across the top and the settled material collects, and from which it is discharged by cones and various types of valves or by a Dorr thickener mechanism and pumps. The names associated with the different designs are the Rittinger spitzkasten, Caldecott cone, Allen cone and Dorr hydroseparator. The various cones are used in metallurgical work in closed circuit grinding and other desliming operations. The Dorr hydroseparator is used in the coal industry, separating fine coal from clay, and in various fine, 300 mesh, separations of clay, whiting, pigments, etc. The mechanical non-hydraulic classifiers include the Dorr, Akins and drag classifiers. They all have inclined tanks with the upper end open. The sloping bottom of the tank is scraped by a device which carries the sand up the slope, or deck, and out of the open end. Dorr does this by reciprocating rakes, Akins by a revolving spiral or helix; the drag classifiers have an endless belt or chain carrying drags running into the bath and up the deck. The operation is somewhat similar in all three, but the Dorr is the most widely used.

The Dorr Classifiers

In the Dorr classifier the feed enters the bath near the middle and the overflow leaves at the lower end of the tank. The principle is in general similar to that of the non-mechanical classifiers, but the surging and agitation caused by the reciprocation of the rakes results in a much cleaner sand. Further, the intermittent raking of the sand up the deck

above the water level allows drainage to take place, which further rids the sand of fines. In many cases water is sprayed on the sands, which tends to wash out the fines and carry them back into the bath, from which they will ultimately escape through the overflow. When the suspending medium is not pure water, the sprays also wash the sands free from the adhering solution, or in some cases even carry out leaching operations. Separations may be made anywhere from 20 to 200 mesh in these machines, although a modified form called the bowl classifier is generally preferred for separations finer than 48 mesh and is used extensively for separations as fine as 325 mesh.

The Dorr bowl classifier is a combination hydroseparator and mechanical classifier. The hydroseparator, or bowl, is very shallow, and sits on top of the lower end of a mechanical or reciprocating rake compartment. The feed enters at the centre of the bowl and the solution and fines overflow at the periphery. The coarse material which settles is ploughed by the bowl mechanism to a central hole in the bottom, through which it drops into a compartment provided with a reciprocating rake. The coarse material, which usually still contains a considerable amount of fine material, is then brought into suspension again by the reciprocating rakes, and the fine material carried up into the bowl again by a current of water, set up by the higher level of the water in the sloping tank. Fresh water is added in the form of a spray by a pipe place across the sloping tank.

Thickening and Clarification

The term thickening is used somewhat loosely. Properly speaking, thickening is the gradual removal of water retained in flocs which have settled and are resting directly one upon another, and is the latter stage of treatment in a settler or thickener. Very frequently, however, the whole process is termed thickening. Where the feed is very dilute, for instance, sewage or turbid river water, and the main object of the treatment is to clarify the liquid, the process is termed clarification and the machine a clarifier. These operations are most advantageously carried out on a flocculent pulp. If the material contains particles smaller than 5 microns in diameter it is practically essential to have the pulp flocculent if these particles are to settle. This often involves special treatment to achieve the most advantageous condition of flocculation.

Conditioning of particles, so that they may be handled more easily and at less cost in sedimentation apparatus, may involve control of conditions during chemical reaction, so that crystals or flocculent precipitates with the desired characteristics are formed, or growing large flocs from small flocs and the avoidance of destruction of good floc structure once obtained.

Most metallurgical pulps are inherently flocculent, or the addition of small quantities of lime make them so. Clays are often flocculent, but, if settlement of a non-flocculent clay is desired, the adjustment of the *pH* value with aluminium sulphate or acid generally causes flocculation. Other inorganic sludges require varying treatments. The largest and most difficult field of flocculation lies in water, sewage, and the treatment of trade waste. In the treatment of water chemical flocculation has long been used, and recently, in the United States, a number of municipal water plants have installed mechanical flocculators of the transverse paddle type to supplement the chemical dosing, with a resultant lower chemical consumption.

Rate of Settling

When a pulp is thoroughly mixed and then allowed to stand, various things may happen, depending on the size distribution, degree of flocculation, and the dilution or ratio of liquid to solid by weight. If the yield point of the pulp is less than that required to hold up the coarsest particles, segregation will take place and a layer of the coarse solids will build up on the bottom. If the pulp is sufficiently flocculent and not too dilute, the remaining solids will settle with a sharp line, leaving a clear, supernatant liquor. If the pulp is too dilute or too dispersed, the line may not form until most of the solids have settled some distance, or a fairly sharp line may form immediately, but the supernatant liquid will be cloudy.

The rate of settlement of the line, in pulps settling with a line, is called the settling rate of the pulp, and is generally expressed in feet per hour. This settling rate may be constant for some distance and then slow up markedly. The dilution at which the marked slowing up in settling rate occurs is called the critical point, and the pulp is then said to be in compression. In this zone, the flocs are conceived to be in close contact, and further subsidence occurs only by compression of the flocs, resulting in elimination of water from the flocs and interstitial spaces.

A rise in temperature has been shown to increase the collective settling rate on pulps containing from 2 to 40 per cent. solids exactly in the proportion that it decreases the viscosity of the water. The effect of the dilution on the settling rate of a pulp is roughly linear, although the graph connecting rate and dilution seldom goes through the origin. Some pulps give graphs with considerable curvature, either convex or concave, and some are slightly S-shaped, but very often they are nearly straight. Due to the fact that the graph connecting rate and dilution is sometimes curved and does not go through the origin, the capacity of a thickening tank is determined not by the settling rate at the feed dilution, but by the rate of a more or less concentrated pulp which gives the lowest capacity, since a concentration zone having this rate would undoubtedly be set up in continuous practice.

If R = settling rate in feet per hour and d_1 the density of the solution, then for every sq. ft. of area $62.5\ d_1\ R$ lb. of solution will become clear every hour. 1 lb. of solids can furnish $(F - D)$ lb. of solution, where F is dilution of the feed to the concentration zone in question and D is discharge dilution. The capacity in lb. solids per sq. ft. per hour is then :—

$$\frac{62.5\ R \times d_1}{(F - D)}$$

or converted to sq. ft. per ton of dry solids per day,

$$\text{Area required} = \frac{1.333\ (F - D)}{R \times d_1}$$

Points from the Discussion

Mr. H. TALBOT, who presided, said that the paper owed its origin to a suggestion by Dr. Dorr, the head of the Dorr-Oliver Co., and president of the American Institute of Chemical Engineers.

Professor W. E. GIBBS said that the actual sedimentation of individual small particles was probably too slow in most cases to be of practical value industrially. The real key to the situation, from the practical standpoint, was to build up from these individual particles something larger, which would settle more rapidly. Therefore, the real art of sedimentation was concerned with the art of floc building. A floc was simply a collection of individual particles, often, of course, intimately bound up with actual molecules of water. That brought one to the point that the water in the floc was present in two distinc forms; part of the water was integrally bound up with the particles of the floc to form its structure, the rest of the water being held loosely within that structure, Whether or not the floc so formed would settle rapidly depended very largely upon its structure. For example, one could have flocs which were built up of a large number of particles combined with much water, fairly tightly held, and containing a good deal of loosely-held, entangled water; they seemed so ragged and concave and drawn out that they did not settle at all well. The shape factor was almost the most important feature. Therefore, one must pay peculiar attention to the method of formation of these flocs so as to get, first of all, a structure which contained as little water as possible, and also a structure which held as little loosely-entangled water as possible, so that the floc would be reasonably dense and would settle rapidly, and when agitated gently in a thickener, for example, it would allow entangled water to escape and would become of increased density without breaking up and becoming re-dispersed in the solution in the form of portions of floc or individual particles.

One of the most interesting things in this subject was the coagulation of the fine suspensions to form aggregates. There were two definite sets of factors which helped to produce coagulation. In the first place, there were those which af-

fected the probability of contact between individual particles of the original suspension. For example, the greater the Brownian movement of the particles, due to their being smaller or to the temperature being raised, the greater was their chance of coming into contact. Again, the lower the viscosity of the solution, the greater the chance of actual contact. The second set of factors comprised those affecting the probability of adhesion of these particles when they came into contact. That adhesion probability was most readily effected by the addition to the solution, or suspension, of flocculating agents or flocculants.

Paper-Making Industry

Mr. JAMES STRACHAN emphasised the great interest of sedimentation processes to the paper-maker, for they had numerous applications in the paper-making industry, from the purification of fresh water supplies to the clarification of the mill effluent. Therefore, it was being studied scientifically in the laboratory and in the mill, and a good deal of money had been saved as the result of this study. The importance of flocculation was well illustrated in the preparation of caustic soda liquor from recovered black ash. In this process the precipitate of calcium carbonate formed from Bunton lime flocculated and settled rapidly, but when Kent lime from the chalk was used flocculation and sedimentation were very difficult operations. Extensive experiments with variations in the temperature of burning did not make any appreciable difference in the case of chalk lime, but a hard-burned Bunton lime gave better flocculation than the same lime burned at a lower temperature. The importance of viscosity and the degree of agitation also became apparent in the preparation of calcium hypochlorite solutions for bleaching in the paper mill. Minimum agitation and a temperature of about 20° C. increased the rate of settling frequently by as much as 50 per cent. In water-softening plant sodium aluminate was found to be a useful flocculant.

In the paper-making process large volumes of water containing suspended matter, fibre and mineral, were circulated in a more or less closed system, with an intermittent or constant overflow. The quantity of water in circulation was generally of the order of 20,000 to 25,000 gallons per ton of paper made, of which 5 to 30 per cent. was overflow to effluent, varying with the process. Three problems were presented in handling this large volume of water. One was to prevent sedimentation where it was not wanted; the second was to obtain maximum sedimentation of the paper-making materials where it was required; and the third lay in the treatment of the overflow or waste-water for recovery of valuable materials. The first two problems were solved easily by proper design of pipes and tanks controlling the rate of flow, but the treatment of the effluent white-water presented difficulties. A large amount of the solids in this overflow might be recovered in suitable sedimentation apparatus, but when the latter was constructed of adequate dimensions other troubles arose in the accumulation of slimy deposits, difficult to handle mechanically, and liable to putrescent decomposition. This white-water contained a colloidal suspension of cellulose, kaolin, alumina and rosin. The presence of air in suspension also added to the difficulties met with in the numerous types of sedimentation apparatus devised and used for the recovery of these solids. In such cases the modern tendency in paper mill practice was directed towards sieving and sedimentation for removal of the coarser particles, followed by a flotation method for the removal of the colloidal suspension by blowing fine streams of air upwards through the suspension. Flocculation treatment of these solids, by the addition of chemicals, was applied in the final waste-water only.

China Clay Purification

A problem in connection with china clay purification was the removal of sand and mica from the kaolin suspension. The removal of sand was comparatively easy by simple sedimentation, but the separation of fine mica was much more difficult. During sedimentation in a quiescent suspension the mica particles frequently followed a zig-zag path, while in an upward-flow apparatus the rate of sedimentation was still slower on account of turbulent movements produced when the upward current met the flat face of a particle. In the former case the rate of sedimentation followed Stoke's law more closely than in the latter. In the laboratory the estimation of mica in kaolin by means of upward flow elutriations, gave much lower results than those obtained from a sedimentation apparatus of proper design. In practice, mica was removed from kaolin suspensions by passing the latter along narrow launders or drags in a shallow stream. This method, evolved by practice long ago in Cornwall, was very effective, and appeared to answer theoretical demands, since a micaceous particle was more likely to settle in a straight line (although not vertical) in a slowly moving stream than in either a quiescent suspension or in an upward flow.

Dr. A. A. PARKER said he had hoped that the authors would have referred to their work on sedimentation of sewage. The difficulty in dealing with this problem, from the basic standpoint, was that during the period of sedimentation biological changes occurred; frequently gases were formed, and probably the electro-chemical character of the particles and bacteria were changing. In fact, quite different rates of sedimentation resulted from altering the *pH* values of the sewage. In complex substances, such as sewage, and even certain natural waters used for industrial and dimestic purposes, there was such a mixture of particles in suspension, some bordering on the colloidal, some being larger particles, that we were almost compelled at the present stage to adopt empirical methods. He mentioned a case in which ferric alum—which was probably more used than any other coagulant for water and sewage—had failed to remove a peaty colouring matter. By altering the proportion of ferric alum, however, and adding a small quantity of sodium aluminate, the colour was removed. It could have been removed with sodium aluminate alone, but in view of the large amount required to be used it would be too costly to do that.

Coal Washery Slurries

Dr. E. T. WILKINS (H.M. Fuel Research Station), discussing some of the results obtained at the Research Station with washery slurries in the baffle type of settling tank, said that the tank used was fitted with a large number of parallel inclined baffles, which promoted a sort of "one-way traffic" circuit, and so helped the solid material to get to the bottom with less interference.

Dr. R. LESSING urged that more stress should be laid upon the difference between clarification and thickening, both of which operations were proceeding in so-called thickeners, clarification at the top and thickening at the bottom. The conditions which favoured optimum results for either operation must be vitally different, and it would be interesting to know how in one tank this double purpose was met, or whether primary clarification and secondary thickening would be more likely to meet any particular case.

Dr. STEWART, replying to the discussion, said that quite a lot of work was in progress concerning sewage purification, some of it by the Dorr-Oliver Co., but it was felt that the time was not yet ripe for the publication of the results.

Recovery of Nitrocellulose from Cinema Film

COMPARATIVELY little difficulty is experienced in removing the topmost gelatine layer from old cinema film intended for conversion into quick-drying lacquers and adhesives. Most of the scrap film on the European market, however, contains an additional intermediate layer, generally of a protein character, which improves adhesion between the emulsion coat and the smooth celluloid surface. Adhering very tenaciously to the celluloid, the usual solvents for proteins such as hot water and ferments are incapable of effecting complete removal of the intermediate layer. Among the special agents which have recently been proposed to cope with this difficulty ("Nitrocellulose," September 1933, page 161) are hydrogen peroxide and hot concentrated phosphoric acid. For example, 30 kg. of scrap film, previously washed with hot water to remove the emulsion coat, are treated for 1 hour at 80 to 100°C. with 0.6 kg. of 40 per cent. hydrogen peroxide in 200 to 300 kg. of water. By the second method, washed cinema film is immersed in 90 per cent. phosphoric acid at about 80°C.

Exploitation of Natural Steam Springs in Tuscany

Boric Acid and Borax Manufacture at Larderello

It is by courtesy of Prince Ginori Conti, who has been closely associated with the Tuscan boracic industry for over thirty years, that we are able to publish the accompanying photographs of manufacturing activities at Larderello, where chemical products and gases are now extracted from the volcanic steam of the fumaroles or "soffioni," whilst the thermal energy of the steam is actually utilised for heating operations or transformed into mechanical or electrical power.

When, in 1904, Prince Ginori Conti was entrusted by his father-in-law, Count Florestano de Larderel, the grandson of the founder, François de Larderel, with the general management of his works, the Tuscan boracic industry was passing through a difficult period owing to the serious crisis due to the formidable competition of borax derived from the recently exploited American fields. The methods then followed for the extraction of boric acid were extremely simple. They consisted mainly in the concentration of the boric waters of the lagoni, or of the waters extracted from the sub-soil surrounding the fumaroles. Concentration was effected by making the waters flow over evaporating pans which were heated by volcanic steam circulating in a flue beneath. The concentrated solution thus obtained was subsequently transferred to tanks in which the acid crystallised on cooling.

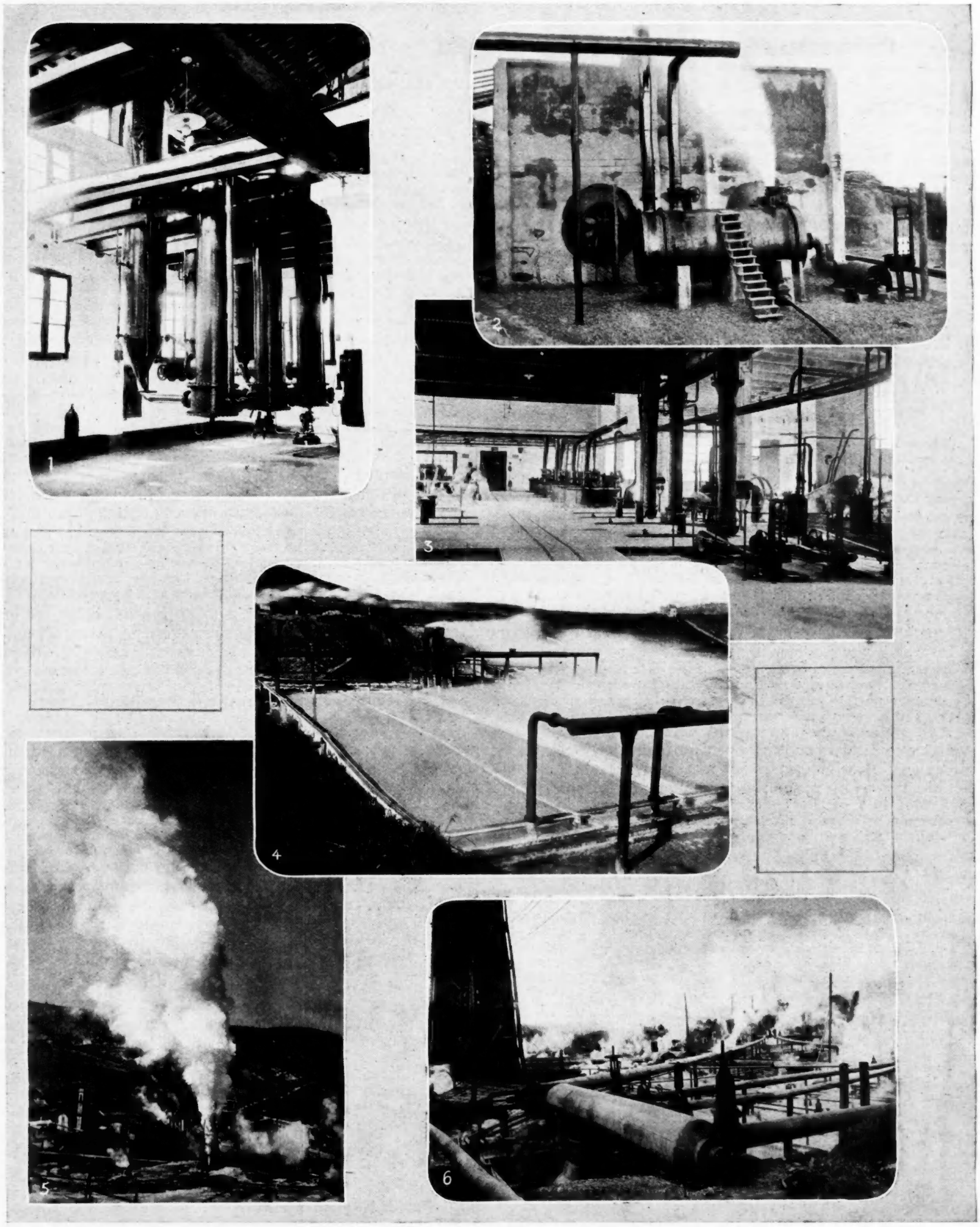
The extraction of boric acid from natural resources in Tuscany dates from 1818, but it was in 1827 that François de Larderel first had the brilliant idea of using the natural steam as a heating agent for concentrating boric solutions. This ingenious device was decisive for the future of the Tuscan boric industry, as he was thereby enabled to dispense with wood fuel, the expense of which heavily handicapped him. This was the first step towards making use of the thermal energy of the volcanic steam springs, but almost a century was to elapse before anything further was done in that direction. Another important feature which was subsequently introduced was that of drilling boreholes in order to obtain boric waters and steam. Had this not been carried out, it is doubtful if the industry would have achieved the brilliant results which raised it to the prosperity it long enjoyed. The first attempts at drilling the volcanic rock around the fumaroles date back probably as far as 1832, but it was not till some years later, about 1837, that this practice became current at the various boric works which had been erected in the immediate neighbourhood of the fumaroles. These works are now eight in number, all of them belonging to the same company, which has been the outcome of the amalgamation of the older firm of Larderel with other minor firms.

The abolition of the old lagoni, doing away with the impurities which formerly polluted the first concentrations of the boric liquors, enables acid at a high grade of purity to be obtained, namely, about 90 per cent., while previously the crude acid barely arrived at 84 per cent. The crude acid as placed on the market is now of 95 per cent. grade. Considerable improvements have also been introduced in the refining plants which allow the mass production of pure acid up to B.P. standard. Borax is manufactured at Larderello, using boric acid and sodium carbonate. Special boric products, such as calcium borate, magnesium borate and sodium perborate, are also manufactured as well as toilet specialities.

Exploitation of Natural Steam Springs at Larderello, Tuscany : The Gas Depurators.

About 92 per cent. of the gaseous mixture is carbon dioxide, although the proportion of gas to steam is about 6 per cent. by weight, at Larderello, so that, reckoning on the total hourly output of steam at these works, it is clear that enormous volumes of carbon dioxide are available. Other components of the gaseous mixture are sulphur dioxide, methane, hydrogen, oxygen, nitrogen and small proportions of rare gases, namely, argon and helium. For the industrial utilisation of these gases, the first step has been the separation of carbon dioxide. In the plant at Larderello, the gas is first entirely freed from sulphur dioxide and subsequently compressed. Sulphur dioxide, which is the most disturbing of the impurities, will ultimately be turned to account for the production of hyposulphites and sulphites.

Another product contained in the volcanic steam, is ammonia. It was barely 28 years ago that the first attempts were made with the purpose of utilising the ammonia contained in the very impure salts which were then the result of the last mother liquors, by making from them into sulphate and carbonate of ammonia. Repeated experiments for the separation of ammonia from the soffioni steam before its further utilisation, have now led to extremely simple and efficient devices which make this feasible.



Exploitation of Natural Steam Springs at Larderello, Tuscany

(1) Triple-effect Concentrators in the Borax Refinery (2) Another View of part of the Concentrating Plant (3) The Ammonium Carbonate Plant (4) One of the Open Evaporating Tanks dealing with Boric Water (5) The general impression which is created by an Open Steam Well (6) Pipes for Collecting and Utilising the Natural Steam

Recent Progress in Fertilisers

Concentrated Fertilisers Discussed by the British Association

In his presidential address to the Agricultural Section of the British Association at Leicester, on September 7, Dr. Alexander Lauder took for his subject "Chemistry and Agriculture," which included many references to fertilisers. Speaking of the progress which has been made in the manufacture and use of fertilisers since the time of Gilbert's address (1880), Dr. Lauder said there were one or two notable dates and achievements to be mentioned. In 1878 Thomas and Gilbert introduced their new basic process for the manufacture of steel which resulted in the production of basic slag as a by-product. It was a few years before the value of the slag as a source of phosphates for plants was discovered. The importance of the new slag in agriculture was first realised in Germany. The earliest experiments in this country were carried out in England by Wrightson and Munro in 1885, and by A. P. Aitken in Scotland about the same time. A year or two later J. J. Dobbie carried out the first experiments with the slag in North Wales.

Extended Use of Basic Slag

The now classic experiments laid down by Professor Somerville in 1896, and carried on and developed by his successors, Sir Thomas Middleton and Professor Gilchrist, have demonstrated the value of this addition to phosphatic fertilisers, and show, as the result of twenty-five years' experiments that basic slag is, for certain types of soil, even more valuable than superphosphate. Changes in the modern methods of steel-making and the effect of the large amount of scrap iron and steel available in the years succeeding the war brought about a considerable alteration in the composition of the slags produced in this country. About ten years ago, the Ministry of Agriculture and Fisheries set up a permanent committee on basic slag "to consider the development and improvement of the manufacture of basic slag and the extension of its use." This committee has now produced a valuable series of reports, the tenth report being published in September, 1932. The work of the committee has been, in general, "to make a detailed study of the agricultural values of the slags now available to farmers and the chemical means by which these values can be expressed." By means of the old but empirical citric acid test, the slags produced in this country can be divided into two groups—a high-soluble group in which 80 per cent. or more of the phosphoric acid is soluble in 2 per cent. citric acid and a low-soluble group in which less than 40 per cent. is soluble.

Superphosphate

The beneficial effects of mineral phosphates as fertilisers was noticed as far back as 1845, but new sources of material and improvements in the methods of grinding have led to a great extension of their use in recent years.

Improved methods of manufacture and better sources of raw material have led to a progressive improvement in the quality of superphosphate. In 1907 the total world production was 7,813,570 metric tons, and in 1930 this had been almost exactly doubled (15,582,162 metric tons). There has, of course, been a fall since then, but this is due very largely to the prevailing depression. Formerly superphosphate was considered an acid manure, and its continued use was supposed to deplete the soil of lime and to increase its acidity. A large amount of experimental work has been carried out in recent years, and the result is to show conclusively that the objections to the use of the so-called physiologically-acid manures have been the result of misconceptions or possibly even misrepresentations. The use of superphosphate does not generally increase the acidity of the soil.

In the year 1898 the British Association took a prominent part in the development of agriculture. The president for that year was Sir William Crookes, who devoted his address to showing that if the rate of increase then assumed of the world's population was correct the world would be faced with a wheat famine in the not-far-distant future. He pointed out also the necessity, if we were to increase the production of wheat, of the increased use of ammonium salts and nitrates as fertilisers. As regards nitrogeneous fertilisers, he showed that we were living on our capital of combined nitrogen compounds, and that there was also the danger of a nitrogen famine to be faced. The remedy he suggested was to devise methods for "fixing" or bringing into combination the nitrogen of the atmosphere, and he actually sketched methods and estimated costs of effecting this combination by electrical means.

Fixation of Atmospheric Nitrogen

As far back as 1784 Cavendish had shown that oxygen and nitrogen could be made to combine under the influence of the electric spark. Many years were to elapse, however, before a practical commercial method was evolved. The earlier methods were electrical in character, and were developed in Norway and Italy, where cheap supplies of electrical energy were available. These methods have been more or less superseded, and ammonia is now manufactured by a synthetic method on an enormous scale at the works of the Imperial Chemical Industries, Ltd., at Billingham. The method used is a modification of the Haber-Bosch process. The practical difficulties which had to be faced were great; of these mention need only be made of the problem of working at pressures of over 200 atmospheres (*i.e.*, over 3,000 lb. per sq. in.) and at an elevated temperature. By this process, which, incidentally, dispenses with the use of sulphuric acid, sulphate of ammonia can now be prepared more cheaply than from gas liquor, where the ammonia is obtained as a by-product.

By the oxidation of ammonia to nitric acid, by means of a suitable catalyst, ammonium nitrate can be prepared, and by mixing this with calcium carbonate a valuable fertiliser, known commercially as "nitro-chalk," is now manufactured.

Concentrated Complete Fertilisers

One of the most interesting developments of the synthetic ammonia industry has been the manufacture of concentrated complete fertilisers containing nitrogen, phosphates, and potash in suitable proportions and all soluble in water. The basis of these fertilisers is a mono-ammonium phosphate, which is made by subjecting finely-ground rock phosphate to the action of a mixture of sulphuric acid and ammonium sulphate. This gives directly a solution of mono-ammonium phosphate containing a little ammonium sulphate, and calcium sulphate is precipitated. The mono-ammonium phosphate contains 12.2 per cent. nitrogen and 61.7 per cent. phosphoric acid, and is thus a highly concentrated fertiliser. By mixing this with ammonium sulphate and a suitable potash salt, a wide range of fertilisers can be obtained. The ingredients are finely ground and then passed to a special incorporator, in which they are churned by means of paddles, whilst saturated steam is blown in. In this way granules are formed, which are then dried; roughly, one ton of such fertilisers supplies as much plant food as two tons of the ordinary mixed fertiliser of similar compositions. They possess the obvious advantage of reducing freight and handling charges and cost of distribution to the land; they are granular in texture and very easy to sow, and they can be stored without risk of deterioration.

A Possible Disadvantage

Another point claimed in favour of these fertilisers is that they contain little except nitrogen, phosphates, and potash, while the ordinary fertiliser contain appreciable, and in some cases large, amounts of calcium, sulphur, and other elements. It is possible that in some soils the absence of the additional substances might be a disadvantage, and a careful comparison of the new fertilisers with the old mixed fertilisers will be necessary to show that no disadvantage attends the use of the new compounds over a number of years.

Letters to the Editor

The Editor welcomes expressions of opinion and fact from responsible persons for publication in these columns. Signed letters are, of course, preferred, but where a desire for anonymity is indicated this will invariably be respected. From time to time letters containing useful ideas and suggestions have been received, signed with a nom-de-plume and giving no information as to their origin. Correspondence cannot be published in THE CHEMICAL AGE unless its authorship is revealed to the Editor.

Prevention of Atmospheric Pollution

SIR,—In an editorial note in THE CHEMICAL AGE of September 30, you ask whether the National Smoke Abatement Society is in agreement with the architects who are stated to be " solidly in favour of the open fire on the grounds of appearance, comfort, and health." I cannot, at the moment, make any reply voicing the official view of the Society, but I think that this letter would be approved by our members.

From the strictly scientific point of view there is little in favour of the open fire burning solid fuel, with which I believe the architects would agree. The appearance is merely a matter of custom and prejudice; the comfort of a single source of heat in cold weather, with the usual consequences of a chilled back and scorched toes, is largely imaginary; and, while the radiation from either coal or smokeless fuel is healthy, the products of combustion, especially from bituminous coal, are notoriously a source of considerable ill-health.

From the practical point of view, and for the purpose of achieving a maximum abatement of smoke in a minimum of time, we have to admit that the open fire is cherished too dearly, although illogically, by the majority of the people in this country, to render its abolition practicable. To urge its complete abolition as a means of ending the smoke nuisance would be not only useless but stupid. Further, apart from all else, the open fire is a cheap source of warmth. And cheapness, to the mass of the people, is the first and most important of all factors.

The reduction in smoke emission from domestic sources must come through (a) a substitution, as far as possible, of the open fire by gas, electric, and central heating methods, and (b) the use of smokeless fuels in place of bituminous coal where the open fire is retained. Without the existence of smokeless solid fuels capable of free and attractive combustion in the open fire, the complete solution to the problem would be extremely difficult. It is, therefore, fortunate that such fuels, both low and high temperature cokes, are becoming more readily available. The question thus narrows down to whether bituminous coal should be used in the raw state and the volatile constituents permitted to pollute the atmosphere or whether the volatile constituents should first be extracted and utilised, and the fuel thereby rendered more efficient and infinitely less harmful.—Yours faithfully,

ARNOLD MARSH.
General Secretary,
National Smoke Abatement Society.

Leather Finishing and Analysis

Papers at the Recent Leather Chemists' Conference

CONTINUING their investigations into the combination of colouring matters with purified hide powder, Dr. G. A. Bravo and Dr. F. Baldracco have now studied the power of combination of acid and basic dyes. In their first communication it was shown that acid dyestuffs combine with hide powder both by chemical combination and by physical adsorption, in accordance with the well-known adsorption formula, and the swelling of proteins as established by Proctor and Wilson, but with basic dyestuffs the action is not the same. From results now obtained, as reported in a paper presented at the International Leather Chemists' Conference, at Amsterdam, it is possible to calculate, as was demonstrated in the earlier paper, the degree of combination with the hide protein, and the results obtained are in complete accord with those previously communicated.

Oxidation of Leather Varnishes

Linseed oil is frequently employed in the manufacture of patent leather. During the ageing process the film of oil undergoes a high degree of oxidation, and it is therefore possible to regulate the oxidation, accelerating it by the addition of oxygen carriers (driers), or retarding it by means of anti-oxidants. Dr. F. Baldracco reported having studied (1) the effect of ozone, (2) the effect of sunlight, and (3) the effect of ultra-violet light on pure linseed oil; also on a mixture of linseed oil with anti-oxidants such as stearic and various other commercial products possessing similar properties. He has found that the addition of these products has a very marked action in retarding oxidation. This retardation is very marked during the early stages of drying.

The Gelatin-Tannin Reaction

The gelatin-tannin reaction has interested chemists ever since the days of Seguin and Humphrey Davy, but even yet is far from being adequately understood. The variability in the composition of the precipitate has led some workers to call it a " colloid " reaction implying that it was something essentially different from ordinary chemical reactions. No doubt the high molecular weight and molecular complexity of the gelatin and tannin make it difficult to follow the reaction quantitatively. However, the studies of J. T. Wood and J. V. Schroeder support the contention that the reaction should not be described as an example of adsorption. In the light of this and more recent work, F. C. Thompson is of the opinion that it is probably best to consider the reaction as the production of an insoluble non-ionised compound by means of ordinary chemical forces.

Estimating Nitrogen in Leather

When an organic nitrogen compound is heated in a current of hydrogen in the presence of finely divided nickel, all nitrogen is converted into ammonia. This reaction forms the basis of a new method for estimating nitrogen in leather. According to G. van der Hoeven a small quantity of the very finely divided leather is weighed into a nickel or porcelain boat, covered with 10 per cent. potassium hydroxide solution and allowed to stand for 15 minutes. Reduced nickel (prepared by reducing the black oxide Ni_2O_3 with hydrogen, and the nickel catalyst by reducing a mixture of two parts of black nickel oxide and one part of asbestos) is now added and the boat placed in a quartz combustion tube behind the nickel impregnated catalyst. Hydrogen is passed through, and the boat carefully heated, while that part of the tube containing the catalyst is maintained at about 250° C. The ammonia formed is collected in a little water, and the solution directly and continuously titrated with 0.1*N* acid from a micro burette, one drop of methyl orange being used as indicator. This method frequently gives higher results than the macro or micro-Kjeldahl methods, but they are more reliable and the procedure is simpler.

Estimation of Acid in Chrome Leather

By treating chrome leather with dilute (about 0.1N) ammonium hydrate at temperature about 60° C., all acid radicals bound with chromium and hide substance are removed, and after well washing the leather, can be estimated in the solution by formal titration. This allows an exact estimation of the basicity (including the weakly dissociated acids) of chrome

leather. Employing this method, C. Riess and A. Papayannis report that the composition of the chrome salt on the fibre was examined in hide powder tanned by different chrome liquors, and well washed after tanning. Only slight traces of neutral salts are dissolved by the ammonia treatment, so that the nature of the acid radicals adsorbed from the chrome liquors can be judged. Thus it was found that formiato-sulphite-oxalato and carbonato-chrome compounds present in the liquor are irreversibly bound by the fibre during tanning.

Materials for Patent Leather Enamels

The importance of uniformity in quality of raw materials for patent leather manufacture was emphasised by Dr. R. Priester, especially in connection with the linseed oil. It appears that some linseed and China wood oils are unsuitable for leather enamels. Synthetic oil prepared according to Scheiber's method is a triglyceride of a linoleic acid containing two conjugated double bonds, from which it might be expected to have properties similar, but milder, to those of wood oil. Such an oil should be of interest to the manufacturer of leather enamels. Dr. Priester also mentioned a method for examining enamel films which give a quick indication of the suitability of the materials used.

British Section Meets at Shoe and Leather Fair

A meeting of the British Section of the International Society of Leather Trades Chemists was held at the Shoe and Leather Fair, Royal Agricultural Hall, London, on October 5, the president of the section, Dr. A. Turnbull, in the chair.

Arising from the minutes, Mr. A. B. Craven proposed that the resolution put by Professor D. McCandlish to the March meeting "that the modified Riess method be adopted as the official method by the British Section for the filtration of tanning solutions, unless the Candle method be requested" be adopted by the section. On putting to the vote, this was carried.

Dr. J. Gordon Parker summarised the report of the Executive Committee meeting held prior to the official opening of the Amsterdam Conference, after which Dr. A. Turnbull presented his report of this conference to the meeting.

Presenting the report of the Committee on Determination of Acidity of Vegetable Tanned Leather, Dr. D. Burton said the object of this committee's work was to study the Atkin-Thompson and Innes methods and ascertain whether each method was prescribed with sufficient exactitude and also which was the better method for confirming the presence of mineral acid in leather. A further series of experiments had been carried out with vegetable tanned goatskin leather samples treated with 0.0 : 0.5 : 1.0 : 1.5 : and 2.0 per cent. sulphuric acid respectively. The pH values were determined by the bubbling hydrogen, glass and quinhydrone electrodes, and also by the colorimetric method. The results were not in sufficiently close agreement and show that further study must be devoted to finding the best method of determining the pH values of these feebly buffered solutions obtained on extracting leather with water. Nevertheless, in practically every case the Innes and Thompson-Atkin methods were in agreement in indicating the presence or absence of strong mineral acids. In some cases the Proctor Searle values were negative indicating the presence of a salt of an organic acid.

Colour Measurement of Tannin Solutions

Changes in colour measurement of tannin solutions was the subject of a paper by G. H. W. Humphreys. The author suggested that the instructions relating to colour measurement of tannin materials as laid down in the I.S.L.T.C. Official Method of Tannin Analysis were inadequate. Certain materials, chiefly quebracho and mimosa, and to a lesser degree blended extracts containing these materials darkened in colour when solutions of analytical strength were exposed to air. A table showing the alteration in colour over a period of five hours for 12 tanning extracts was given. Two solid mimosa extracts darkened to the extent of 0.8 red in two hours from the time of filtration, and sulphited quebracho extract increased by 0.4 red in four hours. Pyrogallo tannins, *e.g.* chestnut, myrabolams and valonia remained constant in colour even after 24 hours.

In a further paper Mr. E. C. Line dealt with insect pests as affecting stored hides and leather. A thorough tidying, cleansing and fumigation was recommended for the destruction of beetle and fly larvæ; fumigation is also employed. Six species of clothes and house moths which infect hides were described; fumigation and sprinkling with such substances as dichlorbenzene, tetrachlorethane, pyrethrum, etc., was advocated.

Chemicals for Leathers

Exhibits at the Shoe and Leather Fair

FIRMS specialising in tanning materials and dyestuffs for the leather trades were prominently exhibiting at the 34th International Shoe and Leather Fair which was in progress at the Royal Agricultural Hall, Islington, from October 2 to October 6. This fair is controlled by the Shoe and Leather Fair Society, Ltd., on the council of which all the principal trade organisations of the associated industries are represented.

Bursoline oils and fat liquors were exhibited by the Clayton Aniline Co., Ltd. This firm make a point of the fact that their manufactures are scientifically controlled from the start to the finish of their manufacture both on the plant and in the laboratory. In addition to oil and fat liquors a full range of acid, basic and direct dyestuffs suitable for the leather trade were also shown, attention being drawn to the well-known "Neolan Dyes" which are fast to light and washing.

Williams (Hounslow), Ltd. devoted their stand to a display of dyes and stains for leather in all shades; Nigrosine and other blacks; Nigrosine base and oil black for boot polish; "Linsol" colours for mineral oils; special colours soluble in nitro-cellulose for "dopes," and non-blooming wax black. This firm are sole manufacturers of the new "Crispin" range of fast dyes for leather.

Dyestuffs of all classes; finishes, nitro-cellulose, fast coating colours, protective lacquers and Kasara colours for splits, Eukanol and Baykanol water pigments, Eukanol brilliant colours for flaming; chrome tanning powders, synthetic tannins (Tanigans), fat liquors (Coripols, Cutisans, B.S. and Igepon), and Mollescal B. for soaking were shown by I. G. Dyestuffs, Ltd.

Imperial Chemical Industries, Ltd., made a display of organic and inorganic chemical for rubber manufacture, accelerators, antioxidants, stabilisers, softeners, and organic colours for rubber, as well as dyestuffs for leather of all tannages, spirit colours for touching up, shoe finishing products, water pigment finishes, fat-liquors, oiling-off compounds and flexible lacquers.

Charles Page and Co., Ltd., who have specialised for many years in supplying tanners, curriers and the allied trades with their requirements in chemicals were showing lactic acid manufactured specially for tanners' use and guaranteed to be commercially free from arsenic, iron, sulphuric acid, and other mineral impurities. As agents for well-known manufacturers they also supply sodium sulphide concentrated, sodium sulphide crystals, sulphite of soda, all of guaranteed standard manufacture.

At the stand occupied by Pancreol, Ltd., considerable prominence was given to "Panchrome" a chrome tanning salt possessing 25 to 26 per cent. Cr_2O_3, in respect of which a great future is claimed, for the very light colour imparted to the leather after the use of "Panchrome," makes it very valuable when the production of pastel shades is desired. A complete range of cellulose and water pigments, covering the requirements for every class of leather to which a pigment finish can be applied, were also shown.

Society of Chemical Industry

Manchester Section

THE Manchester section of the Society of Chemical Industry held its first meeting of the 1933-34 session at the Engineers' Club, on October 6, when Dr. A. Schedler read a paper on "Chemistry, Old and New," in which he gave a general survey of the history of the science from the time of the early Egyptians to the present day. Dr. T. Callan was in the chair.

Chemistry, said Dr. Schedler, was first systematically and practically carried out by the priests of Egypt, but it was considered as a State secret which was only divulged to the sons of the king. It was an art of the Egyptian priests which was dedicated to Osiris, and represented the first instance of practical chemistry carried out by an organised body for some definite purpose; probably in connection with their peculiar rites and codes. As instances of their remarkable achievements he need only mention the practice of embalming, the preparation and dyeing of textile materials, and the manufacture of pottery. In the famous Academy of Alexandria chemistry was regarded and taught as a science, prominence being given to the study of metals, of which mercury, and sometimes sulphur, were considered to be the principals.

In the seventh century there appeared the so-called Arabian school. The result was a compromise, and the recognition of sulphur and mercury as elements which, according to the Egyptian school, were the fundamental principles of metals. Through the conquest of Spain by the Moorish Arabs chemistry was brought to Europe, and its study found a place in the universities of France and Italy, and, finally, in the monasteries. It was then taken up by distinguished men in holy orders and by famous scholars. Theophrastus Paracelsus (1526) gave lectures at the University of Basle and founded the so-called higher chemistry, or chemistry in the service of medicine. According to Paracelsus life was a chemical process and man was a chemical compound. Good life indicated a correct proportion of the elements, and illness was to be counteracted by dosing the patient with the elements he lacked.

Dr. Schedler also referred to the work of Glauber, Boyle, Dalton, Lavoisier, and Lord Rutherford and his collaborators. At the present day the value of the chemist was gauged not so much by his knowledge and skill, as the ease with which he fitted into the general scheme of industry.

Glasgow Section

The opening meeting of the Glasgow section was held jointly with the Glasgow section of the Institute of Chemistry at the Royal Technical College, on October 6. Professor F. J. Wilson occupied the chair and a paper on "Friction Tests on Lubricating Oils" was read by Dr. J. W. Donaldson, of Scotts' Shipbuilding and Engineering Co., Ltd., Greenock.

Dr. DONALDSON said he had been assisted by Mr. D. R. Hutchison, of the same firm, in the work described. After stressing the need for close co-operation between the chemist and the engineer on the subject of lubrication, he said it had been found that under conditions of boundary lubrication oils of similar viscosity produced different results. Thus, for want of a better term, some oils were described as being more "oily" than others and it was in an endeavour to construct a simple mechanical device capable of giving discriminating results with oils of similar specification that this work was undertaken. After testing various types of design he had succeeded in making an apparatus satisfying all the necessary conditions. It consisted of a ¾ in. ball attached to a pendulum and pointer and resting on three ½ in. balls immersed in an oil bath. The smaller ball thus makes contact with the larger at three points and by varying the load on the pendulum the effect of pressure between the bearings could be investigated. By means of an electrical heating arrangement the oil could be examined under temperatures up to 250° F.

By making observations of the swing of the pendulum as recorded by the pointer it was found possible to calculate the coefficient of friction. With this apparatus mineral, animal and vegetable and compounded oils were tested at different temperatures and pressures. Mineral, animal and vegetable oils subjected to this test did not behave in a similar fashion. With a mineral the coefficient of friction was found to rise with temperature but with animal and vegetable oils the frictional coefficient rises to a maximum with a rise of temperature and then decreases as the temperature rises further. It was also shown that the addition of even a small amount of animal or vegetable oil to a mineral oil produced a considerable change in the frictional properties. The tests were conducted under boundary conditions which, Dr. Donaldson said, did not so largely occur in actual practice but when they did occur the use of an unsuitable lubricating oil led to such expense that there seemed sufficient justification for carrying out such tests. "Oiliness" was only one property of an oil and, important as it was, it had to be considered in relation to other properties before coming to any conclusions as to the suitability of an oil for a specified purpose.

Dr. HOPPER asked the approximate cost of the apparatus described and whether it was readily obtainable.

Mr. HUTCHINSON replied that the chief difficulty in making this apparatus was in fitting the ball into the seat and though the exact cost of the apparatus had not been quoted he thought it would cost about £5.

Society of Public Analysts

Origin of Lead in Canned Sardines

AN ordinary meeting of the Society of Public Analysts was held at the Chemical Society's rooms, Burlington House, on October 4, the president, Mr. F. W. F. Arnaud, in the chair.

Certificates were read in favour of H. G. Coles, B.Sc., M.A., A.I.C.; A. F. Colson, B.Sc., A.I.C.; C. A. Dunbar-Mitchell, M.A., A.I.C.; A. D. Husband, F.I.C.; G. V. James, B.Sc., A.I.C.; J. B. McKean, F.I.C.; J. G. Peirce, B.Sc.; J. Rae; V. Venkatachalam, M.A.; and A. M. Ward, D.Sc., Ph.D., A.I.C. The following were elected members of the society: L. H. James, M.Sc., A.I.C., and A. Jones, M.Sc.

The occurrence and origin of lead in canned sardines was the subject of a paper by Dr. L. H. Lampitt, and Mr. H. S. Rooke. Canned sardines, according to the authors, have been found to be seriously contaminated with lead. Investigation of the origin of the lead has shown an apparent connection between the amount of solder exposed in the can and the lead-content of the sardines; solder evidently causes some contamination with lead. But this is not the only source, for sardines packed in cans where no lead could be derived from the container have also shown contamination with lead. It has been proved that sardines cooked on grills covered with so-called "tin" containing appreciable quantities of lead are badly contaminated with this metal, whereas, if pure tin is used on these grills, the lead-content of the sardines falls to a negligibly low figure. The metal of the grills, therefore, is the chief source of contamination of sardines with lead. In the authors' opinion the lead-content of canned sardines should not be substantially more than 5 to 8 parts per million; figures above this indicate avoidable contamination during the preparation of the sardines before canning.

Fur Dyes and Dermatitis

In a further paper on the chemical examination of furs in relation to dermatitis, H. E. Cox, M.Sc., F.I.C., gave details of the kind of fur and mode of dyeing of 216 furs suspected of having caused dermatitis; of these, 37 were undyed, and it is thought that they could not have caused the disease. Chemical tests for the differentiation of *p*-phenylenediamine from Bandrowski's base were given, and also a colorimetric method for determining small quantities of the diamine. Experiments were described showing that *p*-phenylenediamine penetrates the dead skin readily but does not pass through or into living skin under normal conditions. The reactions of *p*-phenylenediamine with blood and serum were described.

In a further investigation of Japanese beeswax, H. Ikuta reported a new hydroxy-fatty acid, $CC_{16}H_{32}O_3$, provisionally termed "hydroxypalmitic acid," which has been isolated from the mixed fatty acids of this beeswax. It melts at 73.8° to 74.2° C., and has a neutralisation value of 205.8. It is readily soluble in alcohol, chloroform and ethyl acetate, but is insoluble in cold petroleum spirit and ether.

"The Independent"

Warm Welcome for the First Number

THE first number of "The Independent," edited by Sir Ernest Benn, and published from Bouverie House, by Independent Weekly Publications, Ltd., was issued on October 7, and met with the cordial reception it deserved. The two guiding principles of its editorial policy will make a special appeal to business men in general, and to the chemical industry in particular. Whole-hearted support will be accorded to the principle that "taxation is far too high." The letters that we receive around budget-time show how crushing is the load of high taxation and how legitimate enterprise is stifled by the diversion of capital from new plant to the tax-gatherer. A paper that deliberately sets out to put this view forward has much to commend it. The second principle is almost a corollary of the first, namely, that the plight of the world is due to political action and to nothing else, and that the repeal of existing oppressive legislation is more important than is the continued output of new laws and restrictions, which prevent men from exercising their freedom of action and continue to increase public expenditure. The independent view in all branches of modern life, especially when it is based upon the sound principles enumerated in Sir Ernest's new venture, is definitely needed to-day. There is a catholicity of interest among the educated British to-day, but whatever that interest may be it will find something to its taste in "The Independent"; whether in music, or in art—two subjects in which so many chemists are no mean practitioners—whether in science, or in finance and in all these it is no bad thing to have our somewhat too complacent modern ideas shaken up. Many readers thoroughly enjoyed the vigorous denunciation of the "New Painting Racket"—but then we never did believe that a child playing with a paint-box could produce pictures fit to rank with old masters.

Speaking at the first of a new series of Individualist Luncheons on Wednesday, Sir Ernest Benn said he had had experience before of the practical difficulties involved in launching a newspaper, but in all his experience he had never met with the embarrassment of such success as "The Independent" had received. He would like to make it clear that the Individualist Movement, the Individualist Bookshop and "The Independent" were now one and the same, in an endeavour to gain attention for a point of view which was all too little heard in public affairs. Their mission was to give all classes of the community material to talk about which would enable them to take up their proper position in society. From previous experience he knew what it was to go through the mill, as so often happened when launching a new publication. He was, therefore, delighted when as a result of the first announcement to wholesale newsagents, orders for 40,000 copies were received. .

British Standards for Creosote

Specification for Fuel in Furnaces

THE British Standards Institution has just issued a specification for creosote for fuel in furnaces, (B.S.S. No. 503-1933). The specification provides for creosote produced as a distillate of coal tar; it must be free from admixtures of petroleum oils, or undistilled crude tars.

In view of the importance of maintaining fluidity it is required that the oil should be free from organic acids, sediment or other impurities likely to choke the burners, and attention is also called to the fact that with some grades of creosote covered by the specification it will be necessary to provide warm storage and heated pipe lines. The specification includes requirements for the physical properties of the material, such as specific gravity, viscosity, water content, matter insoluble in benzol, fluidity, flash point, ash and calorific value. The method by which tests are to be carried out are given in appendices.

Copies of this specification can be obtained from the Publications Dept., British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

Fading of Dyed Cotton

A New Fading Station for the Shirley Institute

THE increasing use that is being made for the Shirley Institute, at Didsbury, by the Lancashire cotton trade and the value of the institute in welding together the different sections of the industry on the technical side, were referred to by Dr. R. H. Pickard, F.R.S., the director, at the fourteenth annual meeting of the members of the British Cotton Industry Research Association, held at the Institute on October 5.

Mr. H. S. Butterworth, vice chairman and honorary treasurer, took the chair and, in moving the adoption of the reports and accounts, emphasised the increase in the activities of the Institute. During the past year, he said, the number of problems that had crowded in upon the staff had far outweighed the resources available. There had been two notable extensions. The Council had authorised the addition of a large high shed to carry out experiments on new blowroom machinery. This was a field to which little attention had been paid in the past, but they believed that with new ideas worked out by some of their physicists rapid progress might be possible in improving methods of cleaning cotton. The other departure was the provision of a fading station. Many of the larger works conducted fading tests under varying conditions, but the Council felt that the Shirley Institute should provide an illuminant of high intensity, as near daylight as possible, which could be operated under controlled conditions of humidity.

Touching on the accounts, Mr. Butterworth pointed out that, whilst it was true that the expenditure had exceeded the receipts by £9,130—£2,670 of which had been expended on buildings and equipment and was charged to capital outlay, whilst £5,180 written off for depreciation. Investments and other liquid assets amounted to £145,435, as compared with £144,184 in the preceding year.

Dr. Pickard said the fading of dyes was an ever-present difficulty to many sections of the industry and trade, and it was often important that there should be some means of testing quickly whether a dyed fabric would or would not withstand the action of light under different conditions. This station was intended to enable dyers to determine at once—say, in twenty minutes to an hour—what the probable behaviour of the material would be after exposure to sunlight for some time. Investigations had shown also that fading had varied under different conditions, as in window curtains, when the windows had been open; hence the need for carrying on tests under controlled conditions of humidity.

Institute of Metals

Activities for the 1933-34 Session

FOLLOWING its recent Silver Jubilee celebrations, the Institute of Metals has just issued the programme of its activities for the session 1933-34. There will be general meetings of the Institute on March 7-8 and in September, at each of which a number of important original metallurgical communications will be presented for discussion, whilst on May 9 the twenty-fourth annual May lecture will be delivered. In addition to the meetings of the parent organisation there will be held monthly throughout the coming session meetings of the Institute's six local sections which are located, respectively, in Birmingham, Glasgow, London, Newcastle-on-Tyne, Sheffield and Swansea. Before these sections there will be read more than 40 papers, whilst in addition there will be exhibitions of cinematograph films of metallurgical interest. The programmes of each section are designed to appeal particularly to persons engaged in local industries. At Birmingham, for instance, papers will be read on "Nickel and Nickel Alloys," "Age Hardening Copper Alloys" and "Rolling Mill Practice," whilst in addition there will be a symposium on defects in cold working.

Membership of the sections is open to all members of the Institute of Metals, but visitors are invited to attend the meetings, particulars of which can be obtained from the secretary, Mr. G. Shaw Scott, M.Sc., 36 Victoria Street, London, S.W.1. The secretary will send membership particulars to anyone interested in the work of the Institute.

Petroleum Technologists

Annual Dinner of the Institution

SEVERAL references to the competitive position of oil and coal, in relation to the tax on fuel oil, were made at the annual dinner of the Institution of Petroleum Technologists, which was held in London, on October 6. Mr. Thomas Dewhurst, president of the Institution, was in the chair.

Engineer Vice-Admiral H. A. BROWN, engineer-in-chief to the Admiralty, who proposed "The Petroleum Industry," said that whatever might be said of the effect of the increasing use of oil upon the consumption of coal, those in the oil industry had no wish to see their products used in an uneconomical and wasteful manner and to reduce the use of coal in that matter, whilst he had also been assured that the oil interests were quite willing to place their enormous distribution organisations at the disposal of any products from coal that might be economically produced. Neither the oil industry nor any other industry alone had the slightest chance of standing on its own footing, because the prosperity of one industry depended on the prosperity of other industries.

Sir ARNOLD T. WILSON, M.P., who proposed "The Institution of Petroleum Technologists" and coupled with the toast the name of the president—Mr. Thomas Dewhurst—said that the total imports of petroleum in all its forms into this country was of the order of something like £25,000,000 a year. The agricultural production of the soil of this country was of the order of £250,000,000, and if we could get 10 per cent. more out of our soil—with the assistance of an *ad valorem* tariff, such as was enjoyed by the coal industry in producing petrol—he would guarantee that we would restore our balance of trade. In the matter of competition between oil and coal it was easy to over-estimate the dangers of the continued imports of petroleum, and he suggested to the members of the Institution that they might possibly do well by turning their attention during the coming year or so to the purely economic side of the industry. Their competitors in the coal trade were tireless in their presentation of statistics. When one studied the petroleum industry from the point of view of national economics, one was confronted with an almost complete lack of authoritative objective figures. Although petroleum and fuel oil and other oils such as lubricating oils, were imported into this country every year there was, on the other side of the sheet, the value of the tankers, which had been made in this country, to carry the oil here, there was the value of the vast quantity of machinery and pipe lines made in this country and sent abroad to the oilfields, there were the wages of the crews of the tankers; the home remittances of the staffs employed on the oilfields in foreign territories and, of course, everybody was painfully aware of the vast sums which were paid to the Chancellor of the Exchequer in respect of import duties.

Presentation to Retiring Secretary

The PRESIDENT, responding, dealt in some detail with the work of the Institution, and said that the latest publication of the League of Nations stated that the nadir of the depression in the world's productive activity appeared to have passed about the middle of 1932. We might, therefore, hope that we had at long last entered the stage of slow revival and that with an improvement in general conditions there would be a corresponding growth in the size, prosperity and usefulness of the Institution. He also referred to the retirement of Commander Stokes-Rees from the secretaryship of the Institution. A number of members had subscribed to a testimonial to Commander Stokes-Rees, which took the form of a substantial cheque, a silver cigarette box suitably inscribed, and an illuminated scroll containing the names of the subscribers.

Commander STOKES-REES, acknowledging these gifts, said he was hopelessly incapable of adequately expressing his gratitude, not only for the magnificent present and the wonderful way in which his health had been drunk, but for the thousand and one kindnesses that had been shown him during the twelve years he had had the honour of being secretary.

The final toast of "Our Guests," was proposed by Mr. J. McConnell Sanders.

Death of Mr. Thomas W. Stuart

Sixty Years in the Chemical Industry

WE regret to record the death of another of the original members of the Society of Chemical Industry, in the person of Mr. Thomas W. Stuart, which occurred suddenly at his residence at Sefton Park, Liverpool, on September 29. Mr. Stuart was 87 years of age and had retired some years ago. Born in 1846, he was educated at Newcastle-upon-Tyne and at Edinburgh University, where he gained two medals for chemistry. In 1886 he was appointed chemist at the alkali works of C. Allhusen and Sons, Gateshead-on-Tyne, being trained under the late Mr. Henry C. Allhusen, and shortly afterwards became manager of the firm's High works, where he had the control of some 400 employees. He was later appointed manager of the chemical works of the Felling Coal, Iron and Chemical Co., Ltd.

Sometime later Charles Tennant and Co. offered him the management of the newly-built Hebburn works, which he undertook in 1875. In 1886 he built and managed the Tennant Salt Works, at Middlesbrough. Mr. Stuart was eventually appointed by the firm to manage the St. Rollox works also, and thus he managed the St. Rollox, Hebburn and Middlesbrough works up to the time of the formation of the United Alkali Co., Ltd., in 1890, when the directors made him manager for their Tyne, Tees, and Scottish works, about 14 works in all. In 1905 the directors appointed him as general technical manager, which position he held for 31 years.

Mr. Stuart distinguished himself as an expert on labour problems in the north of England, and successfully conducted forty labour arbitrations. As a result he was held in high esteem by trade union officials and members. After 60 years' work he retired in 1926 at the age of 80 and was appointed a director of the United Alkali Co., which was subsequently absorbed by Imperial Chemical Industries, Ltd. Mr. Stuart was an honorary Fellow of the Institute of Chemistry, and an honorary member of the Boilermakers' and Iron and Steel Shipbuilders' Society, and had been a director of the Sunderland Gas Co. and the Sunderland and South Shields Water Co.

Soap Trade Mark

Action for Alleged Infringement

IN the Manchester Chancery Court on October 4-5, the Deputy of the Chancellor, Mr. R. Peel, K.C., heard the trial of an action in which John Joseph Dixon, soap manufacturer, Ashton Old Road, Openshaw, asked that Joseph Taylor and William Cowells, trading as the Pine-exx Liquid and Disinfectant Soap Co., at 279 Broad Street, Pendleton, be restrained from using the word "Pine-exx," or any other word similar to "Pine-ette," in such a way as to lead people to believe the soap so described is manufactured or sold by the plaintiff; and also from infringing the plaintiff's Trade Mark No. 531,885, in Class 47.

The plaintiff's case was that he had sold liquid soap under the name "Pine-ette" since 1924 and built up a very large business, his trade now being about 7,000 gal. per week. He supplied in bulk to people, styled agents, who put the stuff in bottles to which they attached labels supplied by him. In 1929 one of his agents, named Jones, started a business on his own account. In January, 1932, Mr. Jones transferred it to Taylor and Cowells and purported to assign to them the right to use the word "Pine-exx."

The Deputy of the Chancellor said he though the word "Pine-exx" was adopted with the object of taking advantage of the connection which the plaintiff had built up under the name "Pine-ette." There was an extraordinary resemblance between the two words phonetically. The bottles were taken from door to door and sold to people who were usually poor and not very intelligent. In those circumstances he was fully satisfied the continuance of the use of the word "Pine-exx" created a great probability of deception. The defendants had not satisfied him that Mr. Dixon knew Mr. Jones was continuing to use the word "Pine-exx" after the solicitors' letter. He granted the plaintiff an injunction as claimed with costs, and ordered labels to be delivered up.

Cuprammonium Spinning Technique

Wet Spinning of Acetate Rayon

WET spun acetate rayon comparing favourably in quality with the product of the dry spinning process is obtained by spinning an acetone solution of cellulose acetate into an aqueous coagulating bath containing not more than 20 per cent. acetone. Following the practice of the cuprammonium rayon process, F. Ohl ("Metallbörse," September 13, page 1167) recommends spinning through a large number of nozzles each of which corresponds to a comparatively small cylindrical coagulating bath. On the whole better results appear to be obtained by applying the spinning methods of the cuprammonium process rather than those of the viscose process.

Spinning through a group of 20-holed glass nozzles with a hole diameter of 0.6 mm, 100 denier filaments were obtained at a winding velocity of 50 metres per minute. The precipitating bath contained 84 per cent. water, 1 per cent. glucose and 15 per cent. acetone and the volume of liquid for continuous operation amounted to about 10 times that of the weight of fibre produced. After 24 hours' working the proportion of acetone in the bath increased by 10 to 20 per cent. In general, about 80 per cent. of the volatile solvent was recoverable in the course of preliminary formation of the filaments, the remainder being recovered by a supplementary treatment. It was found preferable, however, to introduce sufficient glucose-containing water into the precipitating liquid reservoir which fed the bath to maintain the acetone content of the later in the neighbourhood of 17 per cent. The resulting excess of precipitating liquid was passed into another reservoir for regeneration.

Under these conditions 800 kg. of 100 denier rayon were produced per day from 1,000 spinning points. Commencing with 20 per cent. cellulose acetate solution, this represents a daily consumption of 4,000 kg. of spinning solution with an acetone (or other solvent) content of 3,200 kg. The solvent content of the coagulating bath increased each hour by about 100 kg. thus calling for an additional amount of 600 of fresh water in that period. As a result of 24 hours' operation, 14,400 kg. of precipitating liquor required to be treated, *i.e.*, to be mixed with a fresh quantum of water and purified from excess solvent. Solvent removal was effected at an elevated temperature either with the aid of compressed air or with a vacuum.

Acetate fibres obtained by this procedure ("Metallbörse," September 20) possessed an average tensile strength of 2.2 to 2.4 grams per denier and a total elasticity of 15 per cent. When spinning cellulose acetate solution by the wet method in a viscose spinning machine, on the other hand, the fibres only possessed a tensile strength of 1.4 grams per denier, which represented no improvement over dry spun acetate rayon.

Indian Lac Industry

Research to be Carried On in England

IT has now been realised that research work confined to the cultivation of lac alone, though valuable in itself, is not sufficient to meet the formidable competition from synthetic substitutes in the western world, and that research must be extended to the manufacturing and technical side. The all-important point is to produce natural shellac in forms best adapted to meet the requirements of the consuming industries. In other words, research work would best be conducted at the consumer's door. For this reason a scheme has been sanctioned under which two Indian chemists and one Indian physicist of proved merit are to be deputed to work in England in the laboratories of a great consuming research organisation. The most important lac consuming industries are the electrical and the oil, paint and varnish industries, and according to the chairman of the Indian Lac Cess Committee, this committee has been fortunate in getting the co-operation of Dr. Jordan, director of the Research Station of the British Paint, Colour and Varnish Manufacturers, Teddington, and Mr. Bayley Parker, director of the British Thomson-Houston Electrical Research Institute, Rugby. The assistance has also been secured of the London Shellac Trade Association. The two Indian chemists will work under Dr. Jordan and Mr. Parker.

British Standards Specifications

Revised Handbook and Indexed List

THE British Standards Institution has issued their half-yearly handbook which includes the report presented at the last annual general meeting, as well as an indexed list of current British standard specifications. The report on the activities of the three divisions—engineering, building and chemical—shows the enormous amount of valuable work voluntarily carried out by the Institution's technical committees. The section devoted to lists of British standard specifications includes a numerical list, the new specifications in course of preparation, and a complete subject index. This index should be in the hands of all drawing offices and purchasing departments throughout the engineering, building, chemical and allied industries, where British standards have proved to be of assistance in the preparation of contracts and tenders. Copies can be obtained from the British Standards Institution (Publications Department), 28 Victoria Street, London, S.W.1, price 1s. 2d. post free.

Titanium Potassium Oxalate

A New Manufacturing Process

A NEW manufacturing process for titanium potassium oxalate is described by Dr. L. Stuckert in the "Chemiker-Zeitung," September 23 (page 754). This process involves preliminary formation of potassium titanate, its dissolution in the theoretical amount of oxalic acid, and isolation of the resulting double salt.

On the technical scale, the contents of a drum of caustic potash are dissolved in the minimum quantity of water in a heated vessel equipped with stirring gear. Sufficient titanic acid, preferably in the non-ignited form, is stirred in to this highly concentrated solution which is maintained at 300 to 400° C., when potassium titanate (K_2TiO_3) is produced. The reaction proceeds with great violence, water being driven off, leaving a stiff, though workable paste consisting of a mixture of potassium meta-titanate, caustic potash and free titanic acid. With the aid of a ladle, the mass is removed from the vessel and allowed to cool in the air upon a level metal surface whilst being broken up with a spade into pieces of about the size of the fist. Complete conversion into potassium meta-titanate is effected by heating for one hour in a muffle furnace at 600 to 650° C. Higher temperatures are not permissible since the titanate melts at about 700° C. Addition of cold water leads to hydrolysis of the potassium meta-titanate with formation of alpha-titanic acid which is readily soluble in oxalic acid.

Pulverisation of the melt and simultaneous hydrolysis of the titanate is effected in a wet drum mill. Whilst the melt is being pulverised, a hot concentrated solution of the whole of the oxalic acid required for production of the double salt is made up in a tank fitted with stirring gear. Into this is then gradually stirred the alkaline emulsion formed in the drum mill. About 15 minutes is taken over the ensuing violent reaction, the whole of the titanic acid being then converted to an almost completely clear solution of titanium potassium oxalate. The latter is forced through a pressure vessel into a storage tank where it is allowed to settle for complete clarification.

Saline Drink for Hot Processes

THE September issue of the "Industrial Safety Bulletin," published by the National Safety First Association, draws attention to saline drink for men engaged on hot processes. When men are employed on very hot work it is necessary to replace the body moisture lost as perspiration by water or a similar drink. What is not universally realised is that the body not only loses water, but also an amount of natural salts. The absence of these salts causes the blood to thicken and so places more work on the heart. A saline drink, recommended by the Home Office, consists of sodium chloride (6 oz.), potassium chloride (4 oz.), and water (1¾ pints). Seventeen fluid ounces of the above solution to be added to every three gallons of drinking water.

News from the Allied Industries

Sugar

An extraordinary general meeting of the Irish Sugar Manufacturing Co., Ltd., will be held at 39-41 Dame Street, Dublin, on October 18, for the purpose of considering a resolution that having regard to the sale of the property and business, the company be wound-up voluntarily, and that G. H. Tulloch, of 39-41 Dame Street, Dublin, be appointed liquidator.

Artificial Silk

Colonel Colville, Parliamentary Secretary to the Department of Overseas Trade, received a deputation from the Silk Association of Great Britain and Ireland on October 5. The deputation expressed anxiety regarding the arrangement for the Import Duties Advisory Committee to defer its work on the revision of the silk and rayon duties pending the Anglo-Japanese industrial discussions. Colonel Colville said that in the opinion of the Government, the outcome of the discussion, might be seriously prejudiced by any changes at the present time in the duties.

Pharmaceutical Products

The list of applications for the offer for sale of 298,200 at 5½ per cent. cumulative preference shares of £1 each at par, and 298,200 ordinary shares of 5s. each at 12s. 6d. per share of Sangers, Ltd., was closed on October 10, the offer having been very heavily over-subscribed. The company owns the entire business and assets of "Sangers," wholesale druggists and sundriesmen, which was established in 1780, and has recently contracted to acquire the whole of the issued share capital of May, Roberts and Co., which carries on a similar business. The average annual combined profits of these two companies for their last three financial years were £119,000, which is more than three times the amount required to pay the total preference dividend on the 7½ per cent. and 5½ per cent. cumulative preference shares.

Shareholders of Boots Pure Drug Co., Ltd., held a special general meeting on October 10 to pass resolutions dividing each of the £1 ordinary shares into four 5s. shares and alter the provisions as to directors' fees. Lord Trent, chairman of the company, who presided, said the board had for many years been constituted almost entirely of whole-time directors. It was, moreover, generally held desirable that the interests of shareholders should be represented on boards of companies by directors who had no other office or employment under the company. The directors had elected to the board Viscount Mersey, Viscount Wolmer and Colonel Braithwaite.

Iron and Steel

The Normanby Park Steelworks (Scunthorpe) of John Lysaght, Ltd., have recently broken their own record by rolling 1,172 tons of steel in twenty-four hours. This is the largest tonnage which the mills at Normanby have turned out in one day. The works are now operating at full blast. Although practically all the steel furnaces are "on," in the smelting shop, this department has been unable to meet the demand of the rolling mills, so numerous are the orders on hand. It was therefore necessary some weeks ago for the firm to augment their own supplies by buying additional steel ingots from the neighbouring Frodingham Iron and Steel Co. The Frodingham and Appleby works of the United Steel Companies, Ltd., and the Redbourne Steelworks of Richard Thomas, Ltd., are also sharing in the revival in the steel trade. The Appleby plate mills set up a record last month.

Molasses

Proposals for the reconstruction of the capital of the United Molasses Co., are to be submitted this autumn for the consideration of shareholders. The position having shown considerable improvement since the annual meeting was held in April last, the directors now feel justified in preparing a reconstruction scheme. With that object in view it has been decided to close the company's books as at September 30 last instead of December 31 as hitherto, and when the audited accounts are issued proposals will be submitted for the reorganisation and writing down of the ordinary share capital, and also for dealing with the arrears of dividends on the preference shares. In addition to a debit balance at profit and loss account amounting to £1,902,283, provision will have to be made for the depreciation of investments in subsidiary and associated companies. These are valued at £1,690,782, but the auditors have expressed the opinion that this is considerably in excess of their present value. While the preference shareholders may be called upon to make a sacrifice so far as dividend areas are concerned, there is no reason to anticipate that they will be expected to give up a part of their capital. Ordinary shareholders, however, must be prepared for a severe writing down of their capital. That the outlook for the company is brighter is made clear by the interim report of the directors. The fall in the consumption of molasses continued until the middle of the current year, and trading profits during the first six months were insufficient to cover full depreciation. Since then, however, there has been an improvement in some of the most important markets, and present conditions give reason to believe that the decline in consumption which started in 1930 has come to an end.

Inventions in the Chemical Industry

Specifications Accepted and Applications for Patents

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Accepted with Dates of Application

Cellulose derivative products.—H. Dreyfus. Feb. 19, 1932. 399,191.

Gas-producing compositions.—Imperial Chemical Industries, Ltd., and W. R. Cousins. Feb. 24, 1932. 399,173.

Manufacture of alloys containing copper and zinc.—H. W. Brownsdon, M. Cook, H. J. Miller, and Imperial Chemical Industries, Ltd. March 24, 1932. 399,177.

Manufacture and production of vat dyestuffs of the anthraquinone series.—J. Y. Johnson (I. G. Farbenindustrie). March 29. 399,182.

Pigments and paints.—Titanium Pigment Co., Inc. April 9, 1931. 399,183.

Process for the manufacture of conversion products from natural resins and esters thereof.—A. Carpmael (I. G. Farbenindustrie). March 30, 1932. 399,206.

Method for the impregnation of organic aggregates for plastic masses.—F. Gassner. April 1, 1931. 399,208.

Process for the manufacture of condensation products from natural resins.—A. Carpmael (I. G. Farbenindustrie). March 31, 1932. 399,211.

Manufacture of artificial resins.—A. Carpmael (I. G. Farbenindustrie). April 5, 1932. 399,232.

Production of alcohol free from fusel oil.—Deutsche Gold- und Silber Scheideanstalt Vorm. Roessler. June 19, 1931. 399,281.

Manufacture of vat dyestuffs.—A. G. Bloxam (Soc. of Chemical Industry in Basle). April 19, 1932. 399,241.

Manufacture and production of alcohols.—J. Y. Johnson (I. G. Farbenindustrie). May 19, 1932. 399,258.

Dyestuffs and their application.—Soc. of Chemical Industry in Basle. May 28, 1931. 399,268.

Dyestuffs and their application.—Soc. of Chemical Industry in Basle. Dec. 31, 1931. 399,274.

Processes of bleaching by means of hypochlorites.—Soc. of Chemical Industry in Basle. Oct. 13, 1931. 399,319.

Cold bleaching process.—Soc. of Chemical Industry in Basle. Oct. 13, 1931. 399,320.

Concentration of latex.—A. Nyrop, and Koefoed, Hauberg, Marstrand and Helweg, Aktieselskabet Titan. Jan. 27, 1933. 399,370.

Anti-halation layers for photographic plates and films.—I. G. Farbenindustrie. Feb. 24, 1932. 399,387.

Process for the manufacture from aqueous rubber dispersions, of a highly viscous substance capable of being shaped, applied with a brush, or sprayed.—Accumulatoren-Fabriek Akt.-Ges. March 1, 1932. 399,394.

Production of fast tints on wool.—Soc. of Chemical Industry in Basle. March 23, 1932. 399,226.

Complete Specifications Open to Public Inspection

MANUFACTURE OF SODIUM ALUMINATE.—Aluminium, Ltd. March 28, 1932. 18517/32.

PROCESS FOR THE PREPARATION OF HIGHER ETHERS.—Henkel et Cie, Ges. March 26, 1932. 3388/33.

PRODUCTION OF ALKALI METAL CARBAMATES.—Mathieson Alkali Works. March 31, 1932. 5738/33.

MANUFACTURE OF SULPHURIC ACID ESTERS OF LEUCO ANTHRAQUINONE AZINES.—I. G. Farbenindustrie. March 26, 1932. 9067/33.

PROCESS FOR THE MANUFACTURE OF 1.4-DIAMINOANTHRAQUINONE-2.3-DISULPHONIC ACID.—I. G. Farbenindustrie. March 26, 1932. 9068/33.

MANUFACTURE OF VAT DYESTUFFS OF THE ANTHRAQUINONS SERIES. I. G. Farbenindustrie. March 26, 1932. 9191/33.

MANUFACTURE OF AZO DYESTUFFS.—E. I. Du Pont de Nemours and Co. March 30, 1932. 9651/33.

MANUFACTURE OF WATER-INSOLUBLE AZO DYESTUFFS.—I. G. Farbenindustrie. April 1, 1932. 9802/33.

MANUFACTURE OF WATER-INSOLUBLE AZO DYESTUFFS.—I. G. Farbenindustrie. April 2, 1932. 9803/33.

MANUFACTURE OF DYESTUFFS OF THE AZINE SERIES.—I. G. Farbenindustrie. April 1, 1932. 9882/33.

Applications for Patents

PREPARATION OF HYDROGENATION PRODUCTS FROM FOLLICLE-HORMONE, ETC.—C. F. Boehringer and Soshne Ges. and W. Dirscherl. Oct. 6. 27605.

DISTILLATION OF MIXTURES OF COAL AND OIL.—E. W. Brocklebank and W. B. Mitford. Oct. 6. 27612.

MANUFACTURE OF CONDENSATION PRODUCTS FOR ALCOHOLS AND PHENOLS.—British Industrial Solvents, Ltd., and H. Langwell. Oct. 5. 27452.

ABIETENE DERIVATIVES, ETC.—M. Charlton and E. I. Du Pont de Nemours and Co. and C. O. Henke. Oct. 5. 27438.

PRODUCTION OF A COMPOUND OF THEOPHYLLINE AND ETANOLAMINE. Chemisch-Pharmazeutische Akt.-Ges. Bad Homburg. Oct. 3. (Germany, Oct. 3, '32.) 27174.

EXTRACTION OF GOLD FROM ARSENICAL ORES.—H. E. Coley. Oct. 3. 27227.

HYDRO-EXTRACTORS.—Fibroplast Ges. Oct. 4. (Germany, Oct. 7, '32.) 27344.

MANUFACTURE OF LAKE COLOURS FROM BASIC DYESTUFFS.—A. A. Harrison and Imperial Chemical Industries, Ltd. Oct. 5. 27437.

PURIFICATION OF WATER.—E. W. A. Humphreys. Oct. 6. 27619.

MANUFACTURE OF CONDENSATION PRODUCTS.—I. G. Farbenindustrie and J. Y. Johnson. Oct. 2. 27057.

MANUFACTURE OF PAINTS, LACQUERS, ETC.—I. G. Farbenindustrie and J. Y. Johnson. Oct. 5. 27444.

MANUFACTURE OF DIACETYL.—I. G. Farbenindustrie and J. Y. Johnson. Oct. 5. 27445.

MANUFACTURE OF MASSES SIMILAR TO SOFT RUBBER.—I. G. Farbenindustrie and J. Y. Johnson. Oct. 7. 27662.

MANUFACTURE OF SYNTHETIC TANNING AGENTS.—I. G. Farbenindustrie and J. Y. Johnson. Oct. 7. 27663.

MANUFACTURE OF HYDROXYDIPHENYLENE COMPOUNDS, ETC.—I. G. Farbenindustrie and J. Y. Johnson. Oct. 3. (Germany, Oct. 5, '32.) 27171.

MANUFACTURE OF HYDROXYDIPHENLENE COMPOUNDS, ETC.—I. G. Farbenindustrie and J. Y. Johnson. Oct. 3. (Germany, Oct. 5, '32.) 27172, 27173.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

WHILE the export market remains unsatisfactory the recent improvement in the home demand for chemicals has been maintained during the past week, and quotations are generally steady. Acetic acid, acetone, formaldehyde, formic and oxalic acids have been notable features among industrial chemicals, while a satisfactory amount of business has been transacted in hydrochloric acid, saltcake, sodium sulphate and acetates of lime. The demand for sodium sulphide continues to be somewhat limited, although showing a slight improvement, while there is a little more steadiness in the copper sulphate market. Diminishing stocks are reported in the coal tar products market. Satisfactory business has been transacted in most products, with creosote oil and naphthalene in good demand. The prices quoted for pitch have militated against increased business although quite a number of inquiries have been received. The position of pharmaceutical chemicals is unchanged. Alterations in exchange rates are still affecting the market, but the general tone is steady. Items in which an increased volume of business has been noted during the week include sodium salicylate, barbitone, methyl salicylate, phenacetin, and phenazone, while lavender and eucalyptus have been the strongest features among the essential oils. Prices of chemical products remain as reported last week, with the exceptions noted below.

LONDON.—Prices on the whole continue very firm with a brisk demand, but there is nothing of special interest on which to comment. The demand for coal tar products remains good, and prices are unchanged from last week.

MANCHESTER.—Firmness continues to be the dominant note in the chemical market here, and, if one excepts, perhaps, an easy tendency in sulphate of copper as a consequence of the fresh weakness in the metal, prices movements downward have been negligible. In some instances the possibility of higher rates is influencing forward buying, but, as a general rule, the moderate buying that has been experienced during the past week has been confined to near delivery business. The contraction in unemployment in Lancashire and the north-west is reacting favourably upon the movement of chemicals and the demand for the leading alkali products, as well as for the acids and some of the potash and magnesium compounds has been reasonably good. Among the tar products, local buying in the pitch section has been relatively disappointing, but inquiry for creosote oil, carbolic acid and the lighter products has been satisfactorily maintained, and, in anticipation of better prices in the near future, sellers are reported to be not at all anxious to dispose of production too far in advance.

SCOTLAND.—Chemical business is steady and inquiries are only for immediate requirements. Any contracts which are being placed at the present time are principally for foreign material in case of adverse rate of exchange rising or difficulties of supplies. Prices of coal tar products remain steady and there is nothing of moment to note, further than that creosote is practically unobtainable at the present time.

General Chemicals

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £49 to £52 ex store. MANCHESTER: £48 10s. to £54 ex store.

ACID, TARTARIC.—LONDON: 11d. per lb. SCOTLAND: B.P. crystals, 11d., carriage paid. MANCHESTER: 11¾d.

CREAM OF TARTAR.—LONDON: £3 19s. per cwt.

FORMALDEHYDE.—LONDON: £28 per ton. SCOTLAND: 40%, £28 ex store.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34 to £36; brown, £32.

POTASSIUM PERMANGANATE.—LONDON: 8¾d. to 9d. per lb. SCOTLAND: B.P. crystals, 8½d. MANCHESTER: Commercial, 8½d. B.P., 8¾d.

SULPHATE OF COPPER.—MANCHESTER: £16 to £16 10s. per ton f.o.b.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 9d. to 10d. per lb.; crude, 60's, 2s. 5d. to 2s. 6d. per gal. MANCHESTER: Crystals, 9d. per lb.; crude, 2s. 8d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 6d. to 1s. 9d. per gal.; pale, 98%, 1s. 4d. to 1s. 5d.; pale 95%, 11d. to 11½d.; dark, 10d., all according to specification; refined, 1s. 8d. to 1s. 9d. LONDON: 98/100%, 1s. 3d.; dark, 95/97%, 11d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; 97/99%, 1s. to 1s. 1d.; dark, 97/99%, 11d. to 1s.; high boiling acid, 2s. 6d. to 3s.

CREOSOTE.—B.S.I. Specification standard, 3d. to 3¼d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3d. to 3¼d. f.o.r. North; 4d. to 4½d. London. MANCHESTER: 3d. to 4¼d. SCOTLAND: Specification oils, 3½d. to 4d.; washed oil, 3½d. to 4d.; light, 3d. to 3½d.; heavy, 4½d. to 5d.

NAPHTHALENE.—Crude, Hot-Pressed, £6 1s. 3d. per ton. Flaked £10 per ton. Purified crystals, £9 15s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—Medium soft, £3 17s. 6d. to £4 per ton. MANCHESTER: £3 12s. 6d. to £3 17s. 6d. f.o.b. LONDON: £3 15s. f.o.b. East Coast port for next season's shipment.

TOLUOL.—90%, 2s. 4d. to 2s. 5d. per gal.; pure, 2s. 9d. to 2s. 10d.

XYLOL.—Commercial, 2s. 4d. to 2s. 5d. per gal.; pure, 2s. 5d. to 2s. 6d.

From Week to Week

MR. L. D. SMITH has been appointed an additional director of Sangers, Ltd.

PROFESSOR A. ROBERTSON has succeeded to the Chair of Organic Chemistry at Liverpool University, in the place of Professor Heilbron.

THE ANNUAL CHEMICAL DINNER, in which members of all the principal societies interested in chemistry will participate, will be held at the Wharncliffe Rooms, Hotel Great Central, London, on Tuesday, November 28.

MR. EDWARD GEORGE CUBITT, J.P. (73), of Honing Hall, Honing, Norfolk, a director of Lawes Chemical Co., and a former director of the Electro-Bleach By-Products Co., left £40,518 (net personalty £2,070).

A SLIGHT ERROR occurred in our report of the recent Chemists' Exhibition in THE CHEMICAL AGE of September 30. The Avantine brand of iso-propyl alcohol which was shown by Howards and Sons, Ltd., is a substitute for S.V.R. (not "S.P.R.") in the manufacture of essences and perfumes and for other purposes.

HORACE CORY AND CO., LTD., states that Mr. D. S. Glover has been appointed a director and chairman in place of Mr. G. P. Watson, resigned; Mr. H. C. Holman has been elected a director in place of Mr. F. E. Wells; W. H. Stentiford have been appointed secretaries; and the registered office will, in future, be at 1 Broad Street Place, E.C.2.

IN THE CHANCERY DIVISION on Monday, Mr. Justice Maugham had before him a petition by Utol, Ltd., for the confirmation of a reduction of their capital from £30,000 to £4,500. It was stated that the company dealt with patent medicines and disinfectants and that the reduction was due to losses owing to trade depression. The total losses amounted to some £21,000. His lordship sanctioned the reduction.

MR. JOHN DAVISON, a director and general manager of the Barrow Hematite Steel Co., died at his home at Barrow on October 7. He was taken ill in his office in the morning, but recovered sufficiently to go home. Mr. Davison, who was 60 years of age, started his career at Consett, Durham, and became commercial manager of the Lanarkshire Steel Co., at Motherwell. He was a member of the National Committee which was set up last year to deal with the reorganisation of the iron and steel industry.

DR. GEORGE TATE, for many years lecturer in chemistry at the Birkenhead Technical College, has retired owing to his growing infirmity after over forty years in that post. Dr. Tate was born at Hastings and educated at the City of London School and at German universities. Since 1881 he has been closely connected with the training of students of chemistry on Merseyside and has engaged extensively in analytical and technical research. Many chemists now practising in Birkenhead have passed through his hands.

THE LABORATORIES AT THE SHIRLEY INSTITUTE, in Didsbury, where the British Cotton Industry Research Association carries on its work, were thrown open to inspection by members on October 5, on the occasion of the fourteenth annual meeting of the association. Those who availed themselves of this opportunity had the company of two distinguished visitors in the persons of Lord Rutherford and Sir Frank Edward Smith. Two notable additions to the laboratories during the past year consist of premises for experimenting with new blowroom machinery for the cleaning of cotton in the spinning mill and a "fading" station for more rapid and reliable testing of dyed fabrics.

AN AGREEMENT HAS BEEN MADE between the Imperial Smelting Corporation and the Sulphide Corporation under which a subsidiary of the former will acquire as a going concern the whole of the business of the spelter, zinc oxide and sulphuric acid works owned by the Sulphide Corporation and situated at Seaton, near West Hartlepool. The Imperial Smelting Corporation have also arranged to acquire the share capital of the Delaville Spelter Co., a concern producing spelter, zinc oxide and zinc dust in the Birmingham area. These purchases do not involve the raising of any fresh capital. The arrangements and terms on which the transactions have been carried through will be explained by the chairman at the annual meeting of the Imperial Smelting Corporation in November. The Imperial Smelting Corporation has an issued capital of £4,494,766, of which £2,069,809 is in 6½ per cent. cumulative preference £1 shares. This corporation, which owns the entire capital of National Smelting Co., operates smelting works at Swansea and Avonmouth, and has important interests in Burma and Australia. The Sulphide Corporation also has substantial interests in Australia. It owns the Central silver-lead-zinc mine at Broken Hill. The paid-up capital is £1,050,000, of which £600,000 is in 10 per cent. non-cumulative £1 preference shares and £450,000 in 15s. ordinary shares.

THE WASTE PAPER AND ARTIFICIAL WOOL FACTORY of Vogel and Schnurmann, in Karlsruhe, was completely destroyed by fire on October 10.

THE ZINC MANUFACTURING CO., LTD., has removed its registered and transfer offices to 12a Charterhouse Square, E.C.1. Telephone: Clerkenwell 7847.

MR. EDMUND HARLEY PLANK (67), of North Lodge, Somerset Road, New Barnet, Herts, formerly a director of Van den Berghs, Ltd., having been connected with the company for 37 years, left £52,741 (net personalty £50,484).

AT A MEETING of the board of the Institute of Physics, held on October 10, the following were elected to membership:—Fellows: R. O. Cherry and A. E. Tattersall; Associates: L. J. Hibbert, T. C. Richards, T. T. Thomas, A. L. Walker and R. E. Wood; student member: D. H. Thomas.

THE IMPORT DUTIES ADVISORY COMMITTEE has received applications for the addition to the free list of solid insoluble quebracho extract and diatomaceous earth, whether ground or unground. Representations should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than November 2.

LORD ATHLONE, Chancellor of London University, formally opened a new extension of the Bradford Technical College on October 7. He expressed pleasure at the close co-operation in textile research between the college and the Government departments in South Africa, which, he said, he knew from his experience of seven years as Governor-General of South Africa, was of the greatest importance to the Dominion. Lord Athlone also unveiled a tablet commemorating the jubilee of the college.

THE HUNDREDTH ANNIVERSARY of the birth of Alfred Nobel, the founder of the Nobel Peace Prize and the Nobel Prizes for science and literature, will be celebrated in Sweden on October 21. Since the first Nobel award was made 19,237,725 kroner (approximately £1,060,000) has been distributed to 166 people of 15 nations. Germany heads the list with 39 prizes and Great Britain, together with Canada and India, comes second with 27. France follows with 26, the United States with 15, Sweden 12, Holland 7, Denmark 7, Switzerland 6, Austria 5, Italy 5, Belgium 4, Norway 4, Spain 3, Poland 2 and Russia 1.

WORKS FOR THE DISTILLATION OF COAL and other bituminous substance, by the Turner process, are to be built in Irvine, Ayrshire, by Charles Turner (Scotland), Ltd. The capital of this company is £1,000,000 divided into 900,000 6 per cent. preference shares and 100,000 ordinary shares of £1 each. The four main products of the Turner process are crude oil, smokeless fuel, gas and electricity. By distillation, the crude oil is converted into motor spirit, Diesel oil, bituminous wax and phenols. For the first section of the plant 21 retorts are to be erected. Tentative contracts for the whole of the output have already been received.

Ruths International Accumulators

Proposals for Reduction of Capital

IN their report for 1932, the directors of Ruths International Accumulators state that they have given careful consideration to the necessity of altering the book values placed on certain assets and have made provision for writing down patent licences and goodwill, investments in subsidiary companies, patent expenses and reserves in a total charged to profit and loss of £274,362, making a total debit thereon of £288,417. This necessitates a capital reduction scheme, and it is proposed to reduce the capital from £500,000 to £180,703 by cancelling the whole paid-up capital on 21,000 10s. shares held by the Swedish subsidiary and cancelling 6s. 9d. per share on the remaining 823,458 issued 10s. shares; the latter holders will receive a repayment of 9d. per share, reducing the nominal value to 2s. 6d. per share. The 155,542 10s. shares at present unissued will be subdivided into four shares of 2s. 6d. each, and the capital again increased to £500,000 by the creation of 2,554,374 new 2s. 6d. shares.

Accompanying the scheme is a circular outlining the history and position of the company. In 1931 the capital was reduced from £500,000 to £282,635, and subsequently increased to £500,000 by the issue of new shares. Later in the year the name was changed from Ruths Steam Storage to the present title. The trading loss of £10,667 for 1932 compares with a net loss of £19,447 for the sixteen months to December 31, 1931. No dividends have yet been paid. The auditors report that the value of patents, licences, and goodwill "is dependent on future successful developments." The company meeting will be held at the Holborn Restaurant, London, on October 31, at 12 noon.

New Chemical Trade Marks

Compiled from official sources by Gee and Co., Patent and Trade Mark Agents, 51-52 Chancery Lane, London, W.C.2.

Opposition to the registration of the following trade marks can be lodged up to October 20, 1933.

Ceedix. 544,070. **Zeta.** 544,072. **Delta.** 544,073. **Gamma.** 544,074. Class 4. Shellacs and lacs for use in manufactures. Angelo Bros,. Ltd., 6 Lyons Range, Calcutta, India. August 25, 1933.

Celestol. 542,472. Class 1. Synthetic resins being chemical substances for use as ingredients in the manufacture of paints, varnishes, lacquers and the like. F. A. Hughes and Co., Ltd., Abbey House, Baker Street, London, N.W.1. June 22, 1933.

Celesto. 540,194. Class 1. Synthetic resins being chemical substances for use as ingredients in the manufacture of paints, varnishes, lacquers, and the like. F. A. Hughes and Co., Ltd., Abbey House, Baker Street, London, N.W.1. March 23, 1933. (By consent.)

Dekindal. 543,066. Class 1. Chemical substances for use in the treatment of textile fabrics and leather in the course of manufacture. H. Th. Böhme A.-G., 29 Moritzstrasse, Chemnitz, Saxony, Germany. July 14, 1933.

Garrapaticida. 543,281. Class 2. Chemical substances used for agricultural, horticultural, veterinary, and sanitary purposes. Cooper, McDougall and Robertson, Ltd., Berkhamsted. July 21, 1933.

Kerasol. 542,672. Class 1. Acid-resisting paints. H. Windsor and Co., Ltd., 748 Fulham Road, Fulham, London, S.W.6. June 29, 1933.

Oppanol. 543,008. Class 1. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives, but not including oil paints and not including any goods of a like kind to oil paints. I. G. Farbenindustrie, Grüneburgplatz, Frankfort-on-Main, Germany. July 12, 1933.

Forthcoming Events

Oct. 16.—The Textile Institute. Joint meeting with N.W. Section of Institution of the Rubber Industry. "Cotton Fabrics for the Rubber Industry." Fletcher Chadwick and W. H. Reece. Reynolds Hall, College of Technology, Manchester.

Oct. 16, 23 and 30.—The National Institute of Industrial Psychology. "The Experiences of a Vocational Adviser." Angus MaCrae. 6 p.m. London School of Economics and Political Science, Houghton Street, London.

Oct. 17.—Hull Chemical and Engineering Society. "Coal Gas for Traction Purposes." F. S. Marsh. 7.45 p.m. Hull Photographic Society's Room, Grey Street, Park Street, Hull.

Oct. 17.—Manchester Literary and Philosophical Society. Ordinary Meeting. 7 p.m. 36 George Street, Manchester.

Oct. 18.—Institute of Fuel. "Recent Developments in Coking Practice." Dr. Ing. H. Koppers. 2.30 p.m. Geological Society, London.

Oct. 18.—Electrodepositors' Technical Society. "The Control Testing of Electrodeposited Coatings." R. B. Mears. 8.15 p.m. Northampton Polytechnic Institute, London.

Oct. 18.—The Institute of the Plastics Industry (London Section). "Health and Safety in the Plastics and Allied Industries." E. J. Wallace. Windsor Castle Hotel, Victoria, London.

Oct. 18.—Society of Glass Technology. Ordinary general meeting. University, Sheffield.

New Companies Registered

Boyd's Chemical Co., Ltd.—Registered September 16. Nominal capital £100 in £1 shares. Manufacturing, wholesale and retail chemists, druggists, drysalters, oil and colour men, etc. Directors: H. G. Rowbotham, 7 Westcliff Avenue, Westcliff-on-Sea; H. G. Rowbotham, W. Loveridge, R. W. West and H. H. Bentley.

The Chemical Reduction Syndicate, Ltd., 49 Moorgate, E.C.2. Registered September 30. Nominal capital, £5,000 in 1s. shares. To acquire and turn to account and trade with inventions, British or foreign patents, patent rights, secret or other processes and the like relating to or connected with the treatment of ores, metals, flaxes, tailings, concentrates, slimes, mineral residues and other produce of mines, etc. Subscribers: F. C. Heley, 61 Moorgate, E.C.2; and Robert H. A. Menschild.

International Tar and Chemical Products, Ltd.—Registered October 7. Nominal capital £1,000 in £1 shares. General dealers, manufacturers of goods relating to tar, bitumen, chemicals and their various by-products, etc. Directors: William T. Harvey, 50 Pall Mall, London, S.W.1. Norman Brettell.

Lancashire Soap & Chemical Co., Ltd., 82 Buckingham Street, Salford, 5, Lancs.—Registered October 3. Nominal capital £1,000 in £1 shares. Manufacturers of and dealers in soap and washing materials, oils, greases, perfumes, oleaginous and saponaceous substances, toilet requisites, chemicals, brushes, etc. Directors: Max Rosenzweig, Jack Rosenzweig, and Mrs. Florence Part.

L.P.C. Lead Pigments & Chemicals, Ltd., First Avenue House, High Holborn, London, W.C.1.—Registered October 6. Nominal capital £1,000 in £1 shares. Manufacturers of and dealers in ferrous and non-ferrous metals, derivatives and compounds, including lead and lead products and pigments and chemicals of all kinds, etc. Directors: Benno Bendix, Phineas F. Kahn.

T. Pilkington & Co., Ltd., Yew Tree Chemical Works, Collyhurst, Manchester. Registered September 30. Nominal capital, £3,000 in £1 shares. To acquire the business of chemical manufacturers formerly carried on by Thomas Pilkington as "T. Pilkington and Co." at Yew Tree Chemical Works, Collyhurst Road, Manchester, and now carried on by his personal representatives. Directors: T. W. Pilkington, 9 Ivy Drive, Alkrington, Middleton; Mrs. L. Gregson and Mrs. E. Battle.

The Northern Smelting and Chemical Co., Ltd., 95 Gresham Street, London, E.C.2.—Registered as a "private" company on October 9. Nominal capital £250,000 in £1 shares. Roasters, smelters, refiners, rollers, galvanisers and manufacturers of and dealers in non-ferrous metals of all kinds, and all compounds, derivatives and by-products thereof, manufacturing chemists, manufacturers and producers of and dealers in chemical substances of every description, promoters of the production and use of non-ferrous metals and chemical substances of all kinds and their compounds, derivatives, etc. A subscriber: L. B. Robinson, 95 Gresham Street, E.C.2.

Chemical Trade Inquiries

Canada.—A firm of manufacturers' agents at Toronto, with branches at Montreal and Vancouver, is desirous of obtaining United Kingdom agencies for pigments, such as zinc oxide, lithopone, etc., on a commission basis, throughout the Dominion. (Ref. No. 398.)

Spain.—An agent established at Barcelona wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of coal-tar pitch and scrap metals. **(Ref. No. 414.)**

Egypt.—A commission agent established at Alexandria desires to obtain the agencies of manufacturers in the United Kingdom of pharmaceutical products, perfumes, etc. **(Ref. No. 418.)**